

MONTHLY WEATHER REVIEW,

NOVEMBER, 1879.

(General Weather Service of the United States.)

WAR DEPARTMENT,

Office of the Chief Signal Officer,

DIVISION OF

TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE AND AGRICULTURE.

INTRODUCTION.

In preparing this REVIEW the following data, received up to November 14th, have been used, viz: the regular tri-daily weather charts, containing the data of simultaneous observations taken at 158 Signal Service stations and 12 Canadian stations, as telegraphed to this office; monthly journals and means 147 and 144 respectively, from the former; reports from 29 Sunset stations; 230 monthly registers from Voluntary Observers; 40 monthly registers from United States Army Post Surgeons; Marine Records; International Simultaneous Observations; monthly reports from Voluntary Observers in, and the local Weather Service of, Missouri; reliable newspaper extracts; special reports.

BAROMETRIC PRESSURE.

The general distribution of atmospheric pressure, as reduced to sea-level, is shown by the isobaric lines on Chart No. II. The area of highest pressure was over the South Atlantic States; the pressure was also apparently high off the Central Pacific Coast region.

Departures from Normal Values for the Month.—By comparison with the average of the past seven years, it is found that the barometric pressure during the present November has been above the average in California, New Mexico, the Southwest, Illinois, Michigan and thence eastward to the Atlantic States where the excess has been greatest; it amounts to 0.09 inch at Eastport, Boston and New York, 0.10 at Cape May, Washington, Charleston and Savannah, (and also at Knoxville, Tenn.,) 0.11 at Lynchburgh and Jacksonville and 0.12 at Norfolk, Wilmington and Augusta. A small deficiency occurs over the Northwest which apparently extends to the coast of Oregon; it amounts to 0.07 inch at Omaha, 0.06 at Pembina, 0.03 at Denver and Virginia City, 0.02 at Salt Lake City and 0.05 at Portland, Or.

General Barometric Range.—The general range for the whole country was about 2.00 inches, as may be seen from the following table, which gives the greatest departures of the actual barometric readings, as compared with the normal values for the month and the hour of observation. These departures refer only to the tri-daily telegraphic reports. An examination of the table shows that the greatest departures were +0.70 at 11:00 p. m. of the 19th, at Bismarck, within the high area No. VIII, and —1.31 at 3:00 p. m. of the 20th, at Halifax, in low area No. XII.

HIGH AREAS.				LOW AREAS.			
NO.	LOCATION.	DATE.	Departures from normal.	NO.	LOCATION.	DATE.	Departures from normal.
I	Illinois	Nov. 1, 7:00 a. m.	+0.44 inch.	I	Kingston	Nov. 3, 7:00 a. m.	—0.34 inch.
II	Minnesota	Nov. 3, 7:00 a. m.	+0.46 inch.	II	Olympia, Or.	Nov. 4, 11:00 p. m.	—0.34 inch.
III	Washington, D. C.	Nov. 5, 7:00 a. m.	+0.48 inch.	III	Pembina	Nov. 7, 7:00 a. m.	—0.66 inch.
IV	Portland, Oreg.	Nov. 6, 11:00 p. m.	+0.30 inch.	IV	Dubuque	Nov. 8, 3:00 p. m.	—0.54 inch.
V	Lower Lake region	Nov. 10, 3:00 p. m.	+0.34 inch.	V	Milwaukee & Escanaba ..	Nov. 8, 11:00 p. m.	—0.54 inch.
VI	Halifax, N. S.	Nov. 14, 7:00 a. m.	+0.47 inch.	VI	San Francisco	Nov. 9, 3:00 p. m.	—0.78 inch.
VII	Lynchburg, Va.	Nov. 17, 7:00 a. m.	+0.27 inch.	VII	Omaha	Nov. 12, 7:00 a. m.	—0.55 inch.
VIII	Salt Lake City	Nov. 17, 11:00 p. m.	+0.57 inch.	VIII	Olympia	Nov. 11, 7:00 a. m.	—0.45 inch.
IX	Bismarck	Nov. 19, 11:00 p. m.	+0.70 inch.	IX	Parry Sound	Nov. 14, 3:00 p. m.	—0.64 inch.
X	Pittsburg	Nov. 24, 7:00 a. m.	+0.36 inch.	X	Chatham	Nov. 15, 11:00 p. m.	—0.70 inch.
XI	North Carolina coast ..	Nov. 24, 11:00 p. m.	+0.36 inch.	XI	Olympia	Nov. 15, 3:00 p. m.	—0.65 inch.
	Halifax	Nov. 27, 7:00 a. m.	+0.60 inch.	XII	Northern Texas	Nov. 15, 11:00 p. m.	—0.27 inch.
	Ohio	Nov. 30, 7:00 a. m.	+0.50 inch.		Sydney	Nov. 19, 7:00 a. m.	—0.22 inch.
	North Carolina coast ..	Nov. 30, 11:00 p. m.	+0.50 inch.		Halifax	Nov. 19, 3:00 p. m.	—0.53 inch.
					Marquette	Nov. 20, 3:00 p. m.	—1.31 inch.
					Pembina	Nov. 22, 3:00 p. m.	—0.56 inch.
					Davenport	Nov. 24, 7:00 a. m.	—0.53 inch.
					Salt Lake City	Nov. 27, 7:00 a. m.	—0.34 inch.
					Olympia	Nov. 28, 7:00 a. m.	—0.42 inch.
					Pembina	Nov. 29, 3:00 p. m.	—0.36 inch.
						Nov. 30, 3:00 p. m.	—0.32 inch.

Local Barometric Ranges for the Month.—The monthly barometric ranges of actual pressure have been greatest in the extreme Eastern States, viz: Portland, 1.40 inch and Eastport, 1.61. The ranges have also been large for the Eastern Rocky Mountain Slope—apparently increasing as we go northward—and at Pembina the range was 1.37. Monthly ranges for San Francisco 1.10 inch, for Sacramento 1.02 and for Visalia 1.02 inch are also very large for that region.

Areas of High Barometer.—Eleven areas of high barometer have been recorded, none of which have been distinguished by particularly high pressures or very low temperatures. Areas Nos. VII, VIII and XI were accompanied by severe "northers" on the Texas coast, for which Off-shore Signals were ordered on the 17th and 28th at Indianola and Galveston.

No. I.—This is a continuation of No. VII of the preceding month, which was central on the 1st in Illinois, extending over the Ohio valley and Missouri, whence it moved rapidly eastward and disappeared on the 2nd off the Middle Atlantic coast.

No. II.—was central on the 1st northwest of Manitoba, moved slowly southeastward over the Upper Mississippi and Ohio valleys, was central over the latter on the 4th, and was over the Middle Atlantic States on the 5th. It was then apparently reinforced by an extensive area of cold air flowing south from the Gulf of St. Lawrence, and high pressure continued off the Atlantic coast until the 12th.

No. III.—This is a small area of high pressure that was off the coast of Oregon on the 5th, and continued during the 6th and part of the 7th.

No. IV.—Pressure rose on the 9th over the Missouri valley and an area of high barometer moved eastward over the Lake region and Middle States, where it was central on the 11th, after which it rapidly disappeared.

No. V.—On the 13th the barometer began to rise rapidly in the St. Lawrence Valley, while the lowest pressure was off the New England coast. The highest pressure moved southward over Nova Scotia and disappeared on the 14th.

No. VI.—The low barometer which was over the Upper Lake region on the 15th was immediately followed by a slight rise in the Northwest, and on the morning of the 16th the pressure was highest over Kentucky and Tennessee, whence it moved rather rapidly to Virginia, and on the 17th disappeared off the Middle Atlantic coast.

No. VII.—On the 15th the barometer rose over California, and an area of high pressure seems to have prevailed northwest of California, while the barometer was low over British America and Oregon. On the 16th the highest pressure moved southeastward, and on the morning of the 17th the barometer was very high over the northern Rocky Mountain plateau region. Salt Lake City reported a temperature of 15°, the lowest for the month. By the morning of the 18th high pressure had extended over the whole of the Upper Lake region, Texas and the eastern Rocky Mountain slope, being apparently highest in Wyoming Territory. The lowest temperature of the month occurred on the 18th at Stockton, 25° and Escanaba, 17°. The barometer continued high over the Northwest and Southwest and Rocky Mountain regions, and on the morning of the 19th, the highest pressure may be located in central Texas. The lowest temperatures of the month were reported, on the 19th, as follows: 29° at Castroville; 32° at San Antonio; 25° at Fort Sill; 27° at Brackettville; 28° at Eagle Pass; 32° at Rio Grande; 23° at Børne; 21° at Fort Davis, and 19° at Uvalde.

No. VIII.—The great extension of the preceding area, No. VII, was probably connected with the development of the low area, which was central over Lake Superior on the morning of the 19th, and which was immediately followed by a still more decided high pressure, moving rapidly southward from Manitoba into the Missouri valley, where it was central on the morning of the 20th; lowest temperatures of the month are reported on the 20th, as follows: -9° at Pembina; -4° at Breckinridge; 0° at Duluth; 1° at Bismarek; 1° at Yankton; 8° at Omaha; 8° at La Crosse; 10° at St. Paul; 14° at Dubuque; 14° at Grand Haven; 15° at Davenport; 16° at Leavenworth; 17° at Keokuk; 21° at St. Louis. On the 21st, in the morning, the pressure was highest over the Ohio valley and Gulf States, and lowest temperatures of the month occurred in the morning, very generally in the East Gulf States, from 29° to 38°; in the South Atlantic States, from 20° to 33°; in Tennessee and the Ohio valley, from 21° to 27°; in the Lower Lake region, from 9° to 19°. At this time, high northwest winds prevailed over the Middle States and New England, attending the very low pressure over the Gulf of St. Lawrence; consequently, in these regions, the lowest temperatures of the month also occurred on the 21st, although the pressure was low and the weather snowing or clearing. The minima were for New England, from 7° to 17°, except Mount Washington, -20°; for the Middle Atlantic States, from 15° to 22°. This area of high pressure, No. VIII, after reaching the Middle Atlantic coast on the 22nd, seems to have pushed northeastward and disappeared on the 23rd. The lowest temperatures of the 22nd were about the same as those of the 21st.

No. IX.—The high barometer No. VII continued with slowly diminishing pressure over the Rocky Mountain region while a second low pressure moved southeastward to the Lake region and was followed by high barometer No. IX whose origin is therefore similar to that of No. VIII. It was central in Dakota on the 22nd, in the morning, moved rapidly southeastward over the Lower Missouri and Ohio valleys, was central in Virginia on the 24th, in the morning, and over the South Atlantic States on the 25th, in the morning, after which it disappeared. The lowest temperatures accompanying this area were not so low as those accompanying No. VIII.

No. X.—The low pressure over the northern portion of the Lake region on the 24th, was followed by an area of moderately high pressure, central in the Missouri valley on the morning of the 25th. The barometer generally rose during that day, with southerly winds over the Ohio valley and East Gulf States. On the morning of the 26th, highest pressure was central over Pennsylvania, and on the morning of the 27th, over Maine and the Lower St. Lawrence valley, and on the morning of the 28th, was east of Nova Scotia.

No. XI.—A severe storm which passed northeastward over the Lake region on the 28th, was followed by a rising barometer from Texas northward to Manitoba, but as a storm was at that time also central near Vancouver's Island, the barometric rise in Manitoba was checked, and the area of highest pressure remained in Texas, whence it extended northeastward and was by the morning of the 29th, central from Missouri to Minnesota; on the morning of the 30th it was central in the Ohio valley and disappeared on the 1st of December off the Middle Atlantic coast.

Areas of Low Barometer.—Eighteen areas of low pressure have passed over or near the region covered by the charts, of which, one, No. XII., (came from the West India Islands,) six, Nos. III, IV, V, X, XV and XVI) originated in the Rocky Mountains, or to the westward thereof, passed southeastward to southern Colorado, and thence east and northeastward to the Gulf of St. Lawrence. Four, namely, Nos. XI, XIII, XIV and XVIII, passed southeastward over Manitoba, thence to the Lower Lake region, and thence northeastward. Three, namely, Nos. II, VI and IX, passed from British Columbia eastward to the Gulf of St. Lawrence.

No. I. This area began in Iowa, 3 p. m. of the 1st, and was accompanied by extensive snow and high winds over the Lake region and New England, disappearing on the 4th, off the coast of Nova Scotia. This storm produced the first snow of the season over the southern portion of the State of New York and along the New England coast; in the interior the snowfall was quite heavy, a fall of twelve inches being reported at several places in Ontario, New York, Vermont and New Hampshire; at Brattleboro', Vt., twenty inches were reported. Cautionary Signals were ordered on the 2nd, at 4 p. m., from Milwaukee to Oswego, and were generally justified. Off-shore Signals were ordered from New York to Lewes, 2nd, 11 p. m., and from Cape Henry to Macon on the 3rd at 7 a. m., and were generally justified. Cautionary Signals were ordered, 3rd, 7 a. m., from New Haven to Eastport, and were partly justified. Several disasters to shipping occurred on the Lakes; schooner "Leesburg" went ashore on Cape Elizabeth, Me., and broke up; her crew of 5 men are supposed to have been lost.

No. II.—The pressure fell on the 4th in Washington Territory, and an extensive area of low pressure moved from Vancouver's Island nearly due eastward, and disappeared north of the Lake region on the 7th, Rain occasionally fell at our northern stations, and the disappearance of the low area was attended by the formation of a trough apparently extending from James's Bay to Texas, into which low area No. III was rapidly merged. No high winds accompanied area No. II, unless previous to its arrival on the Pacific coast. Cautionary Signals were ordered on the 4th, at 7 a. m., from Duluth to Chicago, and were not justified by high winds accompanying this area, but were partially justified by the high winds accompanying low area No. III.

No. III was, on the morning of the 7th, central in Utah, and on the 8th moved from Kansas northeastward to the Upper Lakes, where rain and occasional high winds prevailed. On the 9th, as it passed to the northward, high southwest winds continued on the Lower Lakes. It disappeared on the 10th near Newfoundland. On the 8th, in the afternoon, as it passed over the Upper Mississippi valley a tornado occurred near Lee's Summit, Mo., and a terrific hail-storm in Crawford Co., Ark., which places were at that time apparently at the southwest extremity of a very elongated area of low pressure. Cautionary Signals were ordered up on Lake Michigan on the 8th at 4 p. m., and were partially justified; also from Mackinaw to Buffalo on the 8th at 11 p. m., and were justified. Cautionary Signals were ordered at Rochester and Oswego on the 9th at 7 a. m., and were not justified; also from Sandy Hook to Lewes on the 9th at 7 a. m., which were partly justified.

No. IV.—This area of low pressure appears to have moved southward along the California coast or was possibly a trough of low pressure trending northeastward and approaching the coast from nearly due west. It passed eastward over California on the 9th, with high winds off the coast and heavy rains over the southern portion of the state; at San Francisco the barometer fell to 29.26, with a high SE. wind, which is the lowest reading recorded at this station during the past nine years. Snow and rain were general throughout Arizona; snow covered all the mountain tops and in the ridges south of Prescott drifted to a depth of 1½ and 2½ feet. Thence over Colorado on the 10th, northeast to Lake Superior on the 11th and eastward to Maine on the 12th, where it disappeared. Brisk and high winds prevailed over the Lakes on the 11th in its advance.

No. V began in Utah on the 11th and followed area No. IV by about twenty four hours, keeping somewhat to the southward. A few stations reported high northerly winds on Lake Michigan on the 11th in its advance, and severe winds prevailed on the 12th over the Lake region. At 5 p. m. of the 12th (local time), a tornado passed over Detroit, Mich., which city was at that time evidently at the centre of lowest pressure as shown by the tri-daily telegraphic isobars. At night severe wind and rain storms, accompanied by thunder and lightning, prevailed over the southern part of New York State. Cautionary Signals were ordered for Lake Michigan on the 11th at 11 p. m., and were partially justified on the 12th; and were ordered from Port Huron to Sandusky on the 12th, at 7 a. m., and were generally justified. They were

ordered from Cleveland to Oswego on the 12th at 4 p. m., and were not justified. Off-shore Signals were ordered on the 12th, at 11 p. m., from Sandy Hook to Cape Hatteras, and were only partially justified.

No. VI.—Pressure fell in British Columbia and Washington Territory on the 10th, and was apparently lowest at Vancouver's Island at 11 p. m. This area moved westward along our northern border, and disappeared north of the Lake region on the 13th. Its track was too far north to be charted on our Map No. I. No high winds are reported in connection with it but abundant rains in the North Pacific region.

No. VII appears to have originated in Iowa, between extensive areas of northwest and easterly winds. It passed rapidly northeastward, and between the hours of 10 a. m. and 2 p. m., high southwesterly gales, with heavy rains, thunder and lightning prevailed from southern Illinois to Ohio, and considerable damage was done to buildings, &c., in over 25 cities in these states, Indiana and Kentucky. On the afternoon of 14th, high southerly winds with rain prevailed over the Lower Lake region. It disappeared on the 15th, north of the St. Lawrence river. Cautionary Signals were ordered on the 14th at 7 a. m., from Mackinaw to Oswego, about half of which were justified; also at 7 a. m. from New York to Lewes, which were justified; also from New Haven to Eastport, on the 14th, at 4 p. m., which were partly justified.

No. VIII began on the 15th at 7 a. m. over the Lower Lake region as a branch of the preceding, and kept a little south of the track of that one, passing over the Gulf of St. Lawrence and reaching Newfoundland on the morning of the 16th. High southwest winds were occasionally reported on the 15th from the stations on the Middle and East Atlantic coasts, and brisk northwest winds prevailed on the 16th on the Lower Lakes. Cautionary Signals were ordered on the 15th at noon from Baltimore to Cape Hatteras, and were generally justified by high southwest winds.

No. IX.—The pressure fell on the 13th in the North Pacific region with southerly winds and rain; the lowest pressure evidently passed over British Columbia and continued within the northern limit of our stations until it disappeared on the 15th, in the afternoon, north of the Upper Lake region, where the barometer had fallen quite low. A heavy wind and snow-storm was reported as occurring on the 14th between Denver and Leadville, Col., during which several men were frozen to death, and high southwest winds were reported from Lake Michigan on the afternoon of the 15th.

No. X.—Was located on the 15th in Wyoming, and snow with occasional high winds prevailed during the night in Wyoming, Colorado and Utah. The central depression extended rapidly southeastward into northern Texas, where it was central on the 16th at 11 p. m., whence it moved eastward, followed by increasing rain or snow, which by midnight of the 17th prevailed on the Lower Lakes and over the Ohio and Mississippi valleys, while the severe "norther" had swept down to Texas and the Gulf coast. On the 18th the lowest pressure passed northeastward from Virginia to Nova Scotia preceded by northeast winds and snow or rain, while the West India hurricane No. XII was advancing northward toward the Bahamas, and northwest gales were prevailing in the eastern portion of the Gulf of Mexico. Cautionary Signals were ordered up on the 17th, while the storm centre was passing from Missouri to Virginia, as follows: at 7 a. m. from Milwaukee to Erie, which were justified on Lake Erie; at 4 p. m. from Buffalo to Oswego, which were not justified; also at 4 p. m. from Wood's Holl to Wilmington which were subsequently justified by Off-Shore winds; at 11 p. m. from Eastport to Boston which were justified. Off-shore Signals were ordered at 7 a. m. of the 17th for Indianola and Galveston which were justified by northerly gales. Off-shore Signals were ordered from New York to Baltimore, the 18th at 4 p. m. which were generally justified. During the night of the 17th a severe NE. snow-storm prevailed over Lake Ontario during which a steam-tug and several scows were sunk and nine persons drowned off Sackett's Harbor, N. Y.; on the 18th, Schooner *Sasco* left Erie during the display of signals, was driven ashore near Fairport and became a total wreck.

No. XI.—The pressure fell very rapidly on the morning of the 18th in Manitoba, preceding low-area No. XI, which seems to have moved southeastward toward the Upper Lake region, over which it passed on the 19th, accompanied by snow and severe gales from the southwest and northwest. On Lake Michigan a heavy sea from the southwest prevailed, driving six vessels ashore along the east coast. It was central in the Upper St. Lawrence valley on the morning of the 20th, at which time cold northwest gales prevailed over the Lake region, West Gulf and Middle Atlantic coasts, and high northwest winds at intermediate points. At this time, the West India hurricane, No. XII, was central east of Long Island, and by 3 p. m. of the 20th, both of these severe storms had merged into one, which was then central near Halifax, where the pressure was 28.59. Cautionary Signals were ordered on the 19th, at 7 a. m., from Duluth to Oswego, which were all justified, but were late for Lakes Michigan and Huron. They were ordered on the 19th, at 4 p. m., from Eastport to Cape Henry, which were justified by winds attending the hurricane No. XII. The following remarks from lake stations indicate the severity of this storm: Milwaukee, 19-20, storm considered one of the severest on the Lakes for years; schooners "North Star" and "Elida" ran ashore near Little Sturgeon Bay; on the east shore of the lake the disasters were serious and many. Port Huron, 19th and 20th, storm very severe on the lake; a number of shipwrecks and several lives lost reported from Sand Beach Harbor; several vessels sailed during display, but meeting with a rough sea, were obliged to put back. Toledo, 19th and 20th, storm very severe on lake; much damage to fishing nets, &c.; numerous disasters reported on lakes. Erie, 20th, schooner 'Waucousta' driven ashore in attempting to enter harbor. Cleveland, 20th, storm very severe; schooner 'Sumatra' was driven ashore near Union depot. Oswego, 19th to 20th, schooner 'Dominion' sailed on the 19th, encountered the storm and, in attempting to put back, lost her bearings and went ashore; vessel a total loss.

No. XII.—This hurricane, from the West Indies, first appears on the Signal Service tri-daily maps, in the falling barometer and increasing winds at Havana, Key West and Punta Rassa, at midnight of the 18th, at which time the centre was evidently some distance to the eastward; then it moved very rapidly north and northeastward, passing Cape Hatteras at 11 p. m. of the 19th and Halifax at 3 p. m. of the 20th. It was preceded by heavy rain on the South Atlantic coast, and snow in the Canadian Provinces and followed by snow in New England. The lowest pressures recorded were at Cape Hatteras, 29.47, at 11 p. m. of the 19th, and Halifax, 28.59, at 3 p. m. of the 20th. Cautionary Signals were ordered in advance of this hurricane, as follows:—On the 20th, at 7 a. m., from Cape Lookout to Smithville, which were, however, already late. Off-shore Signals were ordered on the 20th, at 7 a. m., from New York to Baltimore, which were justified. Among the reports from vessels are the following:—The schooner *O. S. Bailey*, from Dominica November 8th, on the 17th, encountered furious gale; 20th, tremendous seas boarded vessel; crew were taken off and landed at Baltimore on November 27th; exact location not given. Steamer *Hermod*, 39°N. 66°W., hurricane for 5 hours from SE. to NW. Steamer *Llanarthan*, 50° 50' N. and 32° 10' W., from the 18th to the 21st, SE. to NE. gales and high sea. Steamship *Leipsig*, 19th, 40° N. and 69° W., barometer 29.05; wind NNE. to NW. force 10, heavy NW. sea. Brig *Una*, 19th, 33°N. 73°W., heavy NW. gale, barometer 29.25. Schooner *Victor Ping*, 19th, in the Gulf Stream, NW. gale. Schooner *Kit Carson*, 19th, in Gulf Stream, NNE. gale; decks swept by high sea. Ship *Stewart Freeman*, 200 miles east of Henlopen, 19th, NW. gale. Barque *Lincoln*, 39°N. 68°W., 19th, ESE. to WSW. heavy gale. Steamer *Albert*, between Magdalen Islands and Pleasant Bay, November 20th. 3:30 p. m., wind suddenly rose to violent gale; 8:30 p. m., veered to NE., hurricane; barometer 27.60 (?). Barque *Susan A. Blaisdall*, 20th, 31°N. 72°W., severe WNW. gale for forty-eight hours. Barque *Grasmere*, 29th, [19th (?) or 20 (?)] 39°N. 66°W. terrific east hurricane for two hours; then south hurricane four hours; then calm half an hour, then hurricane more severe than at first. Schooner "*Addie Fuller*" on the 19th, in 36° 03' N. 74° 33' W., and 20th in 34° 20' N. 74° 39' W., reports during the night between the 19th and 20th had a severe hurricane, lowest barometer 29.30 about midnight as read off; highest force of wind 80 to 90; wind commenced from NNE. and backed gradually to NW. Baltimore, November 20th, Bay steamers delayed and reported heavy NW. gales and cold weather; harbor very rough and tide unusually low; steamer "*Mystic*" driven ashore and bilged near Queenstown. Several smaller vessels capsized and sunk in Bay and some lives lost.

No. XIII.—apparently moved southeastward into Manitoba where the barometer fell very rapidly on the evening of the 21st. The area of lowest pressure moved east-southeastward from over Lake Superior into the Upper St. Lawrence valley, where it was central 3 p. m. of the 23rd, having been accompanied over the Lake region by snows and high southerly, veering to northwest winds which had generally subsided by 11 p. m. of the 23rd. The storm-centre reached Newfoundland by 3 p. m. of the 24th. Cautionary Signals were ordered on the 21st at 11 p. m. from Duluth to Milwaukee which were partly justified; also on the 22nd at 7 a. m. from Chicago to Oswego which were generally justified, and on the 22nd at 11 p. m. from Eastport to Cape Henry which were justified, but rather late for the Middle Atlantic coast. Off shore Signals were ordered on the 23rd at 7 a. m. from Cape Lookout to Cape Henry which were justified, and, also, at 11 p. m. from Lewes to Portland, Me., which were mostly justified.

No. XIV.—This area pursued a path nearly parallel to that of the preceding, but lying slightly to the northward. It was central in Manitoba 7:00 a. m. of the 24th, and in the Lower St. Lawrence at 3 p. m. of the 25th, having been accompanied over the Lake region by high SW. to NW. winds and occasional light snows. It disappeared on the 26th, in the morning, over the Gulf of St. Lawrence. Cautionary Signals were ordered on the 24th at 7 a. m. from Duluth to Port Huron which were partly justified; at 4 p. m. from Detroit to Oswego which were generally justified, and at 11 p. m. from Sandy Hook to Cape May, only partly justified. Nov. 25th, Buffalo, nearly all vessels that left port were forced to put back and reported a terrific storm on the lake.

No. XV.—An extensive area of low pressure prevailed over the Rocky Mountain region on the 25th, in the morning, and the low centre No. XVI was at that time well marked in the Northern Rocky Mountain Plateau region, and on the next day the low centre No. XV developed on the Eastern Rocky Mountain Slope. No. XV passed slowly northeastward over Iowa, where it was central at 3 p. m. and 11 p. m. of the 26th, while the area of southerly winds, rain or snow extended over the entire Lake region and still further to the northeastward. High winds prevailed on the Lakes on the afternoon of the 27th, and by 11 p. m. a trough of low pressure extended from the centre of No. XV, which was then near Grand Lake, Canada, to the centre of No. XVI, which was then in the Missouri valley. Cautionary Signals were ordered on the 26th at noon from Duluth to Chicago, and at 3 p. m. from Grand Haven to Buffalo, and at 11 p. m. from Rochester to Oswego, all which were generally justified. On the 27th, at 11 p. m., while the storm was central in the valley of the Ottawa river, Cautionary Signals were ordered at Eastport.

No. XVI.—This area appears to have moved southward into Idaho on the morning of the 25th, areas of cloud and rain having preceded it according to the reports from stations in the British possessions. It moved slowly southeastward into the northern portion of New Mexico, where it was central on the morning of the 27th, and thence eastward through Indian Territory, where it turned northeast, and at 3 p. m. of the 27th a trough of low pressure extended from Indian Territory northeastward to Lake Huron, where No. XV was then central. The subsequent path of No. XVI lay a little to the south of the path of No. XV, and on the morning of the 28th, when No. XVI was central in Michigan, No. XV had apparently

disappeared, and a severe storm of wind, with rain and snow, prevailed over the Lake region throughout the day. High southerly winds were also reported from the Middle and East Atlantic coasts. The storm passed over the mouth of the St. Lawrence on the 29th and disappeared over the Gulf on the 30th. Cautionary Signals were ordered on the 28th at noon from New York to Lewes, and at 4 p. m. from Lewes to Smithville, and from New York to Portland, which were generally justified as Cautionaries, and were subsequently changed to Off-shore and again justified. In the rear of this storm northerly winds prevailed over the southwest, and Cautionary Off-shore Signals were ordered on the 28th at 7 a. m., at Indianola and Galveston, and were justified. November 28th, Cleveland, "The most severe storm of the season; fences and trees blown down; lake very rough."

XVII.—This was an indefinite area of low pressure which appeared off the coast of British Columbia on the 29th and 30, where it was accompanied by southerly winds and rain. It appears to have passed eastward into British America. Its track is too indefinite to be charted on Map No. I.

No. XVIII.—This depression appears to have been central north of Dakota on the morning of the 30th, and was probably a branch of No. XVII. By midnight it was north of Lake Superior, while high southerly winds and occasional light snows were reported at several stations in the Lower Lake region. Its path is too indefinite to be traced on Map No. I.

INTERNATIONAL METEOROLOGY.

Three International Charts, Nos. IV, V and VI, accompany the present *Review*. No. IV indicates the probable course of low-pressure areas over the North Atlantic ocean and neighboring waters and continents during the month of October, 1879, and is based upon data received at this office up to November 30th, 1879. Nos. V and VI are charts for the month of April, 1878 and are based upon International Simultaneous Observations, as described in the *Review* for July, 1879, supplemented by such other observations as have been considered specially applicable and trustworthy.

Since the publication of the October *Review* valuable reports of observations relating to low-area No. V made at Cienfuegos, Baracoa and Sagua le Grand, Cuba, have been received through Mr. Vines, of Havana, but which do not change the track of centre as already given on Chart No. I for that month.

On Chart No. IV, the tracks of fifteen areas of low-pressure are traced, which, during a portion of their existence, were located over the North Atlantic and North Pacific oceans or neighboring waters. Portions of areas Nos. I, V, VI, XIII and XIV appeared on Chart No. I of October *Review*. No. II was over the eastern portion of the Gulf of Mexico during October 5th and 6th. There are decided indications of its existence during the 3rd and 4th, in the positions, as shown; on the 7th, it merged with an extensive depression over the Northwest. No. IV originated about mid ocean and, on the 11th, 12th and 13th, moved northward off the banks of Newfoundland as a very severe storm. It is probable that the depression which appeared to the northwest of the British Isles on the 16th, was a continuation of this area. Nos. V and VI appeared on Chart I of the October *Review* and are here reproduced, as it is probable that the area formed by their union, moved over the northern portion of the Atlantic, from the 20th to the 25th. Nos. I, III and from VII to XV, can only, as yet, be traced over the area shown.

TEMPERATURE OF THE AIR.

The general distribution of temperature for November, 1879, is shown by the isothermal lines upon Chart No. II, accompanying which is a table of comparative temperatures. Like the preceding month the average temperature of the present month has been above the normal in the districts east of the Rocky Mountains and below the normal in those to the westward. The departure from the normal, however, over the eastern portions of the country has not been so marked as it was for October. The excess is greatest from the Gulf coast to the Ohio and Upper Mississippi valleys, over which region it amounts to four or five degrees; in the Atlantic States, Lake region and along the eastern slope of the Rocky Mountains it varies from a half to one and a half of a degree. West of the Rocky Mountains the departure from the normal has been greater than last month and has amounted to —2.5 degrees along the Pacific coast and from —3 to —5 degrees in Utah and Idaho.

Minimum and Maximum Temperatures:—An examination of the minimum temperatures shows that they occurred, with few exceptions, from the 17th to the 22nd, during the regime of high areas Nos. VII and VIII, and ranged, during these days, from —9° at Pembina, Dak., to 39° at Brownsville, Tex.; from 0° at Alpena, Mich., to 32° at Pensacola, Fla.; and from 11° at Eastport, Me., to 60° at Key West. On the summit of Pike's Peak, the minimum (—15°) occurred on the 17th and 18th, and on the summit of Mount Washington (—20°) on the 20th. The exceptions to the above generalization occurred on the 4th in the Lake region; from the 24th to the 28th over the Pacific States, Plateau Districts and Montana, and from the 28th to the 30th, over the Eastern Slope of the Rocky Mountains and Texas. An examination of the maximum temperatures shows that they occurred, almost without exception, during the first half of the month. In the Pacific States, Plateau Districts, Eastern Rocky Mountain Slope, and northern part of the Northwest, they occurred from the 3rd to the 6th, and varied, as follows:—65° at San Francisco, Cal., 80° at Red Bluff, Cal., 67° at Winnemucca, Nev. and Salt Lake City, Utah, 76° at Denver, Col. and North Platte, Neb., and 44° at Breckinridge, Minn. Over the eastern portion of the United States, they occurred chiefly from the 8th to the 15th, and varied from 54° at Escanaba, Mich. and 55° at Eastport, Me., to 92° at Laredo, Tex. and 84° at Key West, Punta Rassa, and Augusta. The maximum on the summit of Pike's Peak (83°) occurred on the 6th, and on the summit of Mount Washington, (44°) on the 9th, 10th and 15th.

Minimum Temperatures, given by states.—*Maine*: 2° at *Orono and 13° at Portland. *New Hampshire*: -20° on Mt. Washington and -8° at Dunbarton. *Vermont*: -10° at *Woodstock and 7° at Burlington. *Massachusetts*: -2° at Billerica and 16° at Wood's Holl. *Rhode Island*: 14° at Newport. *Connecticut*: 7° at *Mystic and 17° at New Haven. *New York*: -2° at *Schroon Lake, 2° at *Plattsburg Barracks and 17° at New York city. *Pennsylvania*: -1° at *Dyberry and 19° at Philadelphia. *Delaware*: 20° at *Dover. *Maryland*: 8° at *Woodstock and 20° at Baltimore. *District of Columbia*: 15° at Washington. *Virginia*: 8° at *Mt. Solon and *Wytheville and 25° at Cape Henry. *West Virginia*: 8° at *Helvetia and 13° at Morgantown. *North Carolina*: 10° at Highlands and 28° at Cape Hatteras. *South Carolina*: 25° at *Aiken and 30° at Charleston. *Georgia*: 20° at Gainesville and 33° at Savannah. *Florida*: 27° at *Houston and 60° at Key West. *Alabama*: 25° at *Green Springs and 33° at Mobile. *Mississippi*: 30° at *Fayette and 31° at Vicksburg. *Louisiana*: 25° at *Okalooska and 38° at New Orleans. *Texas*: 19° at Uvalde and Graham and 43° at Indianola and Galveston. *Ohio*: 8° at *Ruggles and 21° at Cincinnati. *Kentucky*: 20° at *Bowling Green and 22° at Louisville. *Tennessee*: 18° at Knoxville and 27° at Memphis. *Arkansas*: 19° at *Mt. Ida and 30° at Little Rock. *Michigan*: 0° at Alpena and 14° at Grand Haven. *Indiana*: 12° at *New Corydon and 18° at Indianapolis. *Illinois*: 6° at *Riley and 25° at Cairo. *Missouri*: 10° at *Oregon and 21° at St. Louis. *Kansas*: 7° at Dodge City and 16° at Leavenworth. *Wisconsin*: -3° at *Neillsville and 11° at Madison. *Iowa*: 4° at *Ames and Boonsboro' and 17° at Keokuk. *Nebraska*: -10° at *Fort Sidney and 8° at Omaha. *Indian Territory*: 24° at Fort Gibson. *Minnesota*: -4° at Breckinridge. *Dakota*: -9° at Pembina and 8° at Fort A. Lincoln. *Colorado*: -15° at Pike's Peak and 11° at Denver. *New Mexico*: 15° at Santa Fé and 28° at La Mesilla. *Wyoming*: -1° at Fort Fred. Steele and 11° at Cheyenne. *Utah*: -4° at Coalville and 15° at Salt Lake City. *Nevada*: 5° at Winnemucca. *Arizona*: 14° at Prescott and 38° at Yuma. *Idaho*: 16° at Boise City. *Montana*: -5° at Virginia City. *California*: 32° at Visalia and 45° at San Francisco. *Oregon*: 24° at Roseburg.

Maximum Temperatures.—*Maine*: 55° at Eastport and 63° at *Cornish. *New Hampshire*: 44° on summit of Mt. Washington and 70° at *Dunbarton. *Vermont*: 63° at Burlington and 66° at *Woodstock. *Massachusetts*: 62° at Wood's Holl and 76° at *Somerset. *Rhode Island*: 64° at Newport. *Connecticut*: 71° at New London. *New York*: 66° at Buffalo and 74° at *Ardenia. *Pennsylvania*: 70° at Erie and 79° at *Milton. *Delaware*: 76° at *Dover. *Maryland*: 78° at Baltimore. *District of Columbia*: 80° at Washington. *Virginia*: 79° at Lynchburg and Fort Whipple, 83° at *Accotink and *Wytheville. *West Virginia*: 77° at *Helvetia and 76° at Morgantown. *North Carolina*: 74° at Fort Macon and 36° at *Weldon. *South Carolina*: 82° at Charleston. *Georgia*: 76° at Atlanta and 90° at *Forsyth. *Florida*: 79° at Pensacola and Key West, and 86° at Houston. *Alabama*: 83° at Montgomery. *Mississippi*: 83° at Vicksburg and 86° at *Brookhaven. *Louisiana*: 84° at Shreveport and 86° at *Okalooska. *Texas*: 80° at Galveston and 92° at Laredo. *Ohio*: 75° at Sandusky and Cincinnati and 80° at *Ringgold. *Kentucky*: 82° at Bowling Green and 78° at Louisville. *Tennessee*: 82° at Memphis. *Arkansas*: 82° at Little Rock. *Michigan*: 74° at *Hudson and 62° at Alpena. *Indiana*: 78° at Indianapolis and 81° at *Laconia. *Illinois*: 80° at *Anna and *Decatur and 69° at Chicago. *Missouri*: 82° at St. Louis. *Kansas*: 73° at Leavenworth and 80° at *Cedar Vale, *Holton and Independence. *Wisconsin*: 67° at Madison and Milwaukee. *Iowa*: 65° at Des Moines and 75° at Ames. *Nebraska*: 65° at Omaha and 76° at North Platte. *Indian Territory*: 83° at Fort Sill. *Minnesota*: 44° at Breckinridge and 61° at St. Paul. *Dakota*: 44° at Pembina and 73° at Yankton. *Colorado*: 76° at Denver and 80° at *Fort Lyon; 33° on summit of Pike's Peak. *New Mexico*: 82° at La Mesilla and 61° at Santa Fé. *Wyoming*: 67° at Cheyenne. *Utah*: 67° at Salt Lake City. *Nevada*: 67° at Winnemucca and 70° at Carson City. *Arizona*: 71° at Prescott and 91° at Yuma. *Idaho*: 62° at Boise City. *Montana*: 57° at Virginia City and 69° at Fort Custer. *California*: 84° at Los Angeles, 80° at Red Bluff and 65° at San Francisco. *Oregon*: 61° at Portland.

Those marked with * are reported by voluntary observers.

Ranges of Temperature at Signal-Service Stations.—The general range of temperature for the whole country has been from -20° on summit of Mount Washington, -15° on Pike's Peak and -9° at Pembina, Dak., to 92° at Laredo, Tex., or a total range of 112°.

The *monthly* ranges have been as follows: *largest* 78° at North Platte, 77° at Fort Custer and 72° at Yankton. The *smallest* has been 20° at San Francisco, 24° at Key West and 37° at Galveston.

The greatest *daily* ranges vary in New England from 21° at Portland to 40° at Burlington and 47° on Mount Washington; Middle Atlantic States, from 24° at Barnegat to 35° at Albany; South Atlantic States, from 18° at Portsmouth to 36° at Augusta and Wilmington; Eastern Gulf States, from 9° at Key West to 30° at Montgomery; Western Gulf States, from 18° at Galveston to 34° at Corsicana; Ohio valley and Tennessee, from 23° at Columbus, 24° at Cairo to 37° at Morgantown; Lower Lakes, from 22° at Erie to 34° at Rochester, Upper Lakes, from 23° at Grand Haven and Milwaukee to 28° at Duluth; Upper Mississippi valley, from 22° at La Crosse to 33° at St. Louis; Red River of the North valley, from 38° at Pembina to 39° at Breckinridge; Lower Missouri valley, from 22° at Fort Stevenson to 42° at Yankton; Texas, from 37° at Henrietta and Laredo to 52° at Uvalde; Eastern Rocky Mountain Slope, from 36° at Deadwood, 45° at Ft. Custer to 46° at Dodge City; Rocky Mountains, from 31° at Virginia City, 36° at Santa Fe, 35° on Pike's Peak to 43° at Denver; Northern and Middle Plateau districts, from 28° at Boise City and Salt Lake City to 43° at Winnemucca; California, from 14° at San Francisco, 31° at Visalia to 36° at Los Angeles.

Frosts.—Occurred very generally in all states and territories north of the thirty-seventh parallel. In Florida they were reported on the 19th, 20th, 21st, 22nd, 23rd, 30th; Eastern Gulf States, 2nd, 3rd, 4th, 5th, 7th, 9th, 10th, 12th, 14th, 16th, 18th to 30th; Western Gulf States, 2nd, 8th, 11th, 18th, 19th to 23rd, 28th to 30th; Indian Territory, 2nd, 15th, 18th to 22nd, 29th; New Mexico, 2nd, 5th, 6th, 12th to 15th, 17th to 30th; heavy white frost in northern Arizona on the 12th; California, 1st, 7th, 8th, 10th to 28th.

Ice has been reported throughout all districts north of Tennessee and Kansas. In the Eastern Gulf States it formed on the 4th, 5th, 21st, 22nd, 23rd, 29th and 30th; In Western Gulf States, on the 4th, 18th, 19th, 20th, 21st, 29th; In Texas and Indian Territory, on the 18th, 19th, 20th, 21st, 29th; At Princeton, Cal., on the 18th and 19th.

Ground Frozen.—Ames, Ia. 27th to 30th; Nora Springs, Ia., 3rd; Tabor, Ia., 30th; Cedar Vale, Kan., 20th, 21st, 24th, 29th; Oregon, Mo., 18th, 19th; Ashley, Mo., 19th; Flushing, Wyo., 3rd; West Charlotte, Vt., 1st, 2nd, 19th, 21st, 30th; Ft. Gibson, Ind. Ter., 19th, 29th; Keokuk, Ia., 19th, 29th; Springfield, Ill., 20th.

PRECIPITATION.

The general distribution of rainfall for the month is illustrated as accurately as possible on Chart No. III, from about 500 reports; this chart is accompanied by a table giving the average precipitation for the month of November by districts. This table shows the rainfall to have been decidedly below the normal throughout the Atlantic and Gulf States, and at Portland, Oregon. In the Middle Atlantic and Eastern Gulf States this deficiency amounts to more than two inches, and the severe droughts previously reported have continued throughout the present month from New Jersey to North Carolina, and in southern Texas. A small deficiency is reported in the Upper Missouri Valley and Minnesota. In the Lake region, Upper Mississippi, and Lower Missouri valleys there is a large excess, amounting in the last district to more than three inches. The combined reports from San Francisco and San Diego show an excess of nearly two inches, which is due to the heavy rains attending low areas Nos. IV and XVIII. Regarding the rain-fall in Missouri, Prof. Nipher states in the Missouri Weather Review that "the greater portion of the rain fell between the 10th and 20th, and was followed by a marked rise in the rivers; these rains occurred as frequent and moderate showers, and were of great benefit to fall crops, checking also the ravages of the Hessian fly.

Special Heavy Rainfalls.—3rd, Holton, Kan., 3.00 inches. 6th, Ft. Barrancas, Fla., 3.83 in. 8th, Howard, Neb., 2.44 in.; Leavenworth, 2.56 in.; Manhattan, Kan., 2.31 in.; Waterville, Kan., 2.00 inches in 8 hours. 9th, Okalooska, La., 5.20 in.; Los Angeles, Cal., 3.41 in.; Calistoga, Cal., 2.60 in.; San Diego, 2.75 in.. 9th and 10th, San Geronio, Cal., 3.92 in. 10th, Pierce City, Mo., 2.00 inches in 2 hours and 40 min. 10th and 11th, Sterling, Ill., 3.40 in.; Holton, Kan., 2.75 in.; Howard, Neb., 3.50 in.; Plattsmouth, Neb., 3.58 in.; Lawrence, Kan., 2.65 in. 11th, Des Moines, 2.58 in.; Leavenworth, 2.58 in.; Guttenburg, Iowa, 2.60 in.; Litchfield, Mich., (10th to 12th) 3.00 in. 11th and 12th, Kansas City, Mo., 2.69 in.; Glenwood, Iowa, 2.95 in.; Thornville, Mich., 2.50 in.; Manhattan, Kan., 4.81 in.; Brookhaven, Miss., 2.60 in.; Waterville, Kan., 4.18 in. 14th and 15th, Arlington, Ind., 3.00 in. 15th, Vicksburg, 1.82 inches in 20 minutes. 17th and 18th, Murphy, N. C., 2.70 in. 18th, Thatcher's Island, 3.14 in.; Northport, Mich., 2.90 in. 18th and 19th, Fayetteville, N. C., 3.00 in. 27th and 28th, Highlands, N. C., 2.80 in. 28th, Vicksburg, 1.81 inches in 1 h. 20 min. 29th and 30th, Calistoga, Cal., 3.20 in.; Red Bluff, 3.15 in.; San Francisco, 2.24 in.; Princeton, Cal., 1.98 in.

Largest Monthly Rain-falls, including Melted Snow:—Mt. Washington, 9.53 inches; Savannah, Mo., 8.90 inches; Alta, Cal., 9.13 inches; Fort Barrancas, Fla., and Ironton, Mo., 8.72 inches; St. Joseph, Mo., 8.45 inches; Erie, 8.35 inches; Okalooska, La., 8.03 inches; New Hope township, Union county, Iowa, nearly 8.00 inches; Leavenworth, 7.85 inches; Manhattan, Kans., 7.83 inches; Oregon, Mo., 7.81 inches; Grafton, N. H., 7.70 inches; Holton, Kans., 7.65 inches; Litchfield, Mich., 7.25 inches; Calistoga, Cal., 7.24 inches; Grand Haven, 7.23 inches; Northport, Mich., 6.93 inches; Thatcher's Island, Mass., 6.91 inches; Milan, Mo., 6.72 inches; Centreville, Mo., 6.82 inches; College Hill, Ohio, 6.75 inches; Des Moines, 6.49 inches; Howard, Neb., and Grand Rapids, Mich., 6.46 inches; Port Stanley, 6.43 inches; Coldwater, Mich., and Quebec, Can., 6.36 inches; Independence, Iowa, 6.30 inches; Fort Leavenworth, Kans., 6.26 inches; Neosho, Mo., 6.22 inches; Niles, Mich., 6.14 inches; Madison, Wis., and New Corydon, Ind., 6.02 inches; Memphis, 6.01 inches; Pierce City, Mo., and Fort Wayne, Ind., 6.00 inches; Redding, Cal., 5.96 inches.

Smallest Monthly Rain-falls, including Melted Snow:—At Randall, Dak., La Mesilla, N. M., Concho, Davis, Laredo, Rio Grande and Edinburg, Tex., none; Fort Hartsuff, Neb., Castroville and Stockton, Tex., trace; El Paso and Uvalde, Tex., 0.01 in.; Salt Lake City, 0.02 in.; Socorro, N. M., and Eagle Pass, Tex., 0.03 in.; Fort Abraham Lincoln, Dak., Fort Griffin, Tex., and Dodge City, 0.04 in.; Camp Sheridan, Neb., Boerne and Brackettville, Tex., 0.05 in.; Fort Stevenson, Dak., 0.06 in.; Olivet, Dak., 0.07 in.; Coleman, Tex., 0.08 in.; Fort Lyon, Col., Fort McPherson, Neb., and North Platte, 0.10 in.; Fort Keogh, Mont., 0.11 in.; Indianola, 0.13 in.; Pilot Point and Brownsville, Tex., 0.14 in.; Bismarck, 0.16 in.; Fort Sidney, Neb., and Castroville, Tex., 0.18 in.; Fort Custer, Mont., 0.19 in.; Denver, 0.21 in.; Yankton and Cheyenne, 0.23 in.; Cedar Keys, Fla., and Sumner, Cal., 0.24 in.; Fort Fred Steele, Wyo. Ter., and Graham, Tex., 0.25 in.; Deadwood and Fort Sill, 0.27 in.; Silver City, N. M., 0.28 in.; Fort Monroe, Va., and Breckenridge, 0.29 in.; Fort McHenry, Md., Gulf Hammock, Fla., 0.30 in.; Henrietta, Tex., Pembina, Dak., and Tulare, Cal., 0.34 in.; Punta Rassa, 0.35 in.; Fort Buford, Dak., 0.37 in.; Fredericksburg, Tex., 0.38 in.; Johnsonstown, Va., 0.40 in.; Weldon, N. C., 0.41 in.; Norfolk, 0.42 in.; Jacksboro and Decatur, Tex., 0.45 in.; Fort Garland, Col., 0.48 in.; Dover Mines, Va., 0.55 in.; Fort McKavett, Tex., 0.57 in.

Rainy Days.—The number of days on which rain or snow has fallen, varies as follows:—New England, 12 to 24; Middle Atlantic States, 2 to 15; South Atlantic States, 5 to 12; Eastern Gulf States, 3 to 14; Western Gulf States, 6 to 13; Lower Lake region, 17 to 25; Upper Lake region, 13 to 23; Ohio valley and Tennessee, 8 to 20; Upper Mississippi valley, 10 to 14; Missouri valley, 3 to 11; Red River of the North valley, 4 to 8; Eastern Rocky Mountain Slope, 2 to 8; Texas, 0 to 9; Rocky Mountains, 1 to 10; California, 3 to 10; Oregon, 12 to 16.

Cloudy Days.—The number varies in New England from 11 to 21; Middle Atlantic States, 2 to 14; South Atlantic States, 3 to 12; Eastern Gulf States, 3 to 14; Western Gulf States, 6 to 13; Lower Lake region, 11 to 26; Upper Lake region, 12 to 19; Ohio valley and Tennessee, 5 to 14; Upper Mississippi valley, 6 to 17; Missouri valley, 3 to 10; Red River of the North valley, 11 to 17; Eastern Rocky Mountain Slope, 3 to 8; Texas, 0 to 10; Rocky Mountains 2 to 12; California, 2 to 9.

Hail.—Ft. Sill, Ind. Ty., 16th; Ft. Gibson, Ind. Ty., 8th; Keokuk, N. C., 14th; St. Louis, Mo., 18th; Oswego, N. Y., 29th; Buffalo, N. Y., 23rd; Louisville, Ky., 5th; Indianapolis, Ind., 5th; Cairo, Ill., 14th; Logansport, Ind., 5th; Burlington, N. H., 16th; Lyndon, Ill., 11th; Cresco, Nora Springs, Monticello, and Ft. Dodge, Ia., 26th; Ft. Madison and Ames, Ia., 27th; Iowa City, Ia., 29th and 30th; Monticello, Ia., 20th and 23rd; Ft. Dodge, Ia., 10th; Holton, Kan., 26th; Independence, Kan., 8th; Cedarville, Kan., 8th; Yates Center, Kan., 16th; Bowling Green, Ky., 28th; Fall River, Mass., 23rd; Grand Rapids, Mich., 3rd; 10th and 24th; Ypsilanti, Mich., 26th; Hudson, Mich., 15th; Oregon, Independence, and Pierce City, Mo., 27th; Somerville, N. J., 25th; Weldon, N. C., 19th; Cincinnati, Ohio, 17th; Jacksonburg, Ohio, 5th and 17th; North Lewisburg, Ohio, 14th; Dyberry, Pa., 27th; Embarrass, Wis., 19th; Red Bluff, Cal., 12th.

Snow fell frequently in the Lake region, Ohio valley, Middle States and New England, and in other regions on the following dates. In North Carolina, on the 19th and 20th, at Fayetteville, five inches fell, the first, so early in the season, for 35 years; South Carolina and Georgia, on the 19th; Upper Mississippi valley, from 1st to 5th, 15th, 17th to 24th, 26th, 27th and 28th; Middle Eastern Rocky Mountain Slope, on 1st, 2nd, 8th, 9th, 15th, 16th, 18th, 21st, 26th, 27th and 28th; North Rocky Mountain Slope, on the 1st, 2nd, 7th, 8th, 9th to 20th, 22nd, 25th to 28th; New Mexico, 8th, 10th, 11th, 16th, 17th, 18th, 27th and 30th; Middle Plateau District, 6th to 9th, 11th to 16th, 21st, 25th, 26th, 27th and 29th; California, at San Geronimo, four thousand feet above sea-level, on the summit of the San Bernardino range, on the 9th and 10th.

Largest Monthly Snow-falls.—Summit, Cal., 56.00 inches; Mt. Washington, 48.90 in.; Grand Haven, 26.40 in.; Grafton, N. H., 26.00 in.; Antrim, N. H., 24.20 in.; Emigrant Gap, Cal., and Pike's Peak 24.00 in.; Couteocookville, N. H., and West Charlotte, Vt., 22.00 in.; Hermosa, Cal., 21.50 in.; Little Mountain, Ohio, 19.40 in.; Strafford, Vt., 19.00 in.; Northport, Mass., 18.40 in.; Alpena, Mich., 18.30 in.; Rowe, Mass., 18.00 in.; Gardiner, Me., 17.50 in.; Cornish, Me., 17.00 in.; Truckee, Cal., 16.75 in.; Oswego, N. Y., 16.05 in.; Rochester, N. Y., and Woodstock, Vt., 16.00 in.; Nile, N. Y., 15.75 in.; Lima, N. Y., 15.60 in.; Clinton, Mass., 15.00 in.; Cleveland, Ohio, 14.70 in.; Palermo, N. Y., 14.25 in.; Coldwater, Mich., 14.00 in.; Westborough, Mass. and Kalamazoo, Mich., 13.50 in.; Penn Yan, N. Y., 13.00 in.; Hudson, Ohio, 12.90 in.; Buffalo, N. Y., 10.80 in.; Orono, Me. and Starkey, N. Y., 10.00 in.

The depth of snow on surface of ground at end of month, was reported as follows: In Utah at Coalville, from a trace to $\frac{1}{2}$ inch; in Montana at Ft. Custer, one inch; in Dakota at Ft. Stevenson and Pembina, and in Minnesota at Breckenridge and St. Paul a trace; in Nevada at North Platte, trace to one inch; in Iowa at Nora Springs a trace, and at Ft. Madison and Davenport, half an inch; in Wisconsin at Madison, half an inch, and at Beloit, Milwaukee and Embarrass, one inch; in northern Illinois and Lyndon, one, and at Riley one and a half inch; in Michigan at Litchfield, half, at Thornville, Hudson and Grand Haven one, at Kalamazoo, $1\frac{1}{2}$, at Escanaba, $1\frac{1}{2}$ inch, and at Alpena, 5 inches; in New York at Oswego, Waterburg and Albany, a trace, at Rochester, $\frac{1}{2}$ inch, and at North Valney, $\frac{3}{4}$ inch; in Vermont at Strafford, 1 inch; and in New Hampshire on the summit of Mt. Washington 1, and at Grafton 2 inches; on the summit of Pikes Peak, Col., from 5 to 60 inches.

Snow from a cloudless sky.—Burlington, Vt., 6th.

Drought continued in the states of New York, New Jersey, West Virginia, Maryland, Virginia, North Carolina and Texas, and is commented upon as follows: In New York at Port Jervis on the 7th the continued dry weather was causing considerable alarm. Throughout southern part of New Jersey such an extended drought as the present has not been known for many years; on the 29th wells had given out and springs were dried up that were never known to fail before; mills have been compelled to stop or greatly curtail operations. In Maryland at Fallston and Sandy Springs month dry throughout, springs and wells failing. In West Virginia at Morgantown, on the 24th, farmers and river men were complaining and wells drying up, &c. In Virginia at Petersburg, on the 11th, the dry and mild weather had caused the wells to dry up, mills were compelled to stop running, and farmers had to come a distance of 50 miles to procure bread-stuff and have their grain ground; at Snowville, month very dry; Dover Mines, drought throughout month causing a great scarcity of water. In North Carolina at Weldon, month remarkably dry, severe drought from the 1st to the 14th, during which time wells failed; in the Dismal Swamp region, swamp fires continued, no rain having fallen for two months. In the southern part of Texas the drought has been severely felt; the observers at Fredericksburg, Boerne, Uvalde, Graham and Coleman report stock suffering severely and farmers unable to sow seed. In Erath county, Texas, on the

8th, the earth of the prairies was cracked so as to make it dangerous to ride across them. The last rain fell here on the evening of July 29th. In Hood county, Texas, the drought and dust were extremely bad; on public roads the dust was a foot in depth. The *Springfield Daily Union* (Ills.) of November 24th states that the "drought in some parts of the west was so severe that water was carried from the Mississippi river at Louisiana, Mo., both east and west into Illinois and Missouri for a distance of 75 miles and nearly all railroads running from the river to the interior had a water train."

Floods.—Kansas City, Mo., on the 13th the Kaw river rose five feet in 24 hours, "heaviest freshet ever known" at that place.

RELATIVE HUMIDITY.

The percentages of mean relative humidity for the month range as follows: New England, 69 to 83; Middle Atlantic States, 59 to 75; South Atlantic States, 61 to 77; Eastern Gulf States, 66 to 79; Western Gulf States, 58 to 75; Ohio valley and Tennessee, 59 to 69; Lower Lake region, 70 to 77; Upper Lake region, 67 to 82; Upper Mississippi valley, 63 to 69; Lower Missouri valley, 52 to 73; Red River of the North valley, 77 to 84; Northern Rocky Mountain Slope, 48 to 56; Texas, 16 to 88; Western Plateau, 47 to 64; California, 61 to 73; Oregon, 78 to 86. *High stations* report the following averages, not corrected for altitude: Mt. Washington, 90.4; Pikes Peak, 52.7; Santa Fe, 46.7; Denver, 49.3; Cheyenne, 39.7; Virginia City, 56.8.

WINDS.

The prevailing winds, at Signal Service stations, are shown by the arrows, flying with the wind, on Chart No. II. The general direction along the Atlantic coast has been northerly, but at the interior stations, Atlanta, Augusta, Charlotte, Lynchburg, Albany and Burlington, and thence to the Southwest, Missouri, Illinois and Michigan, southerly. North and west of this region northwesterly winds predominated. On the Pacific coast they were southerly at Portland and Olympia, and northerly in California. Below are given some of the maximum velocities, in miles per hour, and some of the larger and smaller total monthly movements, registered at the Signal Service stations:

Maximum Velocities of Winds.—3rd, Thatcher's Island, E., 64 miles per hour; 6th, Ft. Custer, NW., 48; 9th, San Francisco, SE., 36; 10th, Key West, NW., 36; 11th, Red Bluff, SE., 42; Winnemucca, SW., 45; Salt Lake City, S., 28; th, Cheyenne, W., 48; Denver, NW., 34; North Platte, W., 54; Cairo, SW., 56; 16th, Dodge City, N., 48; 17th, Coleman, Tex., N., 48; 18th, Kittyhawk, N., 50; Indianola, N., 52; Galveston, N., 38; 19th, Ft. Stevenson, Dak., W., 60; Bismarck, N., 46; Pembina, NW., 40; St. Paul, NW., 46; Madison, NW., 40; Grand Haven, W., 42; Punta Rasa, NW., 46; 20th, Cape Henry, NW., 52 miles; Cape May, NW., 83; Sandy Hook, NW., 60; Sandusky, NW., 62; Morgantown, NW., 45; Atlanta, NW., 36; Cape Lookout, NW., 46; Albany, NW., 44; 24th, Breckenridge, NW., 44; 25th, Virginia City, NE., 36; 26th, Sacramento, N., 36; 28th, Pike's Peak, N. 80; Wood's Holl, S., 40; 29th, Cape May, NW., 50; 30th, Mt. Washington, NW., 108.

Total Movements of the Air.—The following are the largest total movements recorded in miles at the Signal Service stations, during the month: On the summit of Pikes Peak, 18,192 miles; Cape May, 14,347; Portsmouth, N. C., 12,103; Thatcher's Island, 12,068; Sandusky, 11,940; Cape Lookout, 11,561; Kittyhawk, 11,396; Sandy Hook, 11,367; Cape Henry, 10,642; Wood's Holl, 10,416; Indianola, 10,052; Erie, 10,056; Cape Hatteras, 9,938; Cleveland, 9,809; Key West, 9,589; Barnegat, 9,231. On the summit of Mt. Washington the working of the anemometer was interfered with by frost-work. The *smallest* are, Visalia, Cal., 1,457 miles; Socorro, N. M., 1,596; Deadwood, Dak., 1,659; La Mesilla, N. M., 1,744; Salt Lake City, 2,222; Lynchburg, 2,312; Nashville, 2,646; Uvalde, Tex., 2,652; Augusta, 2,781; Virginia City, 2,858; Ft. Davis, Tex., 2,888; Cedar Keys, Fla., 2,953; Dubuque, 2,976.

Local Storms.—Pageville, Cass co., Mo., 8th, 2:15 p. m., a severe tornado passed over the town from the southwest, destroying the depot building of the Pacific railroad, several stores and dwellings and a blacksmith's shop, all which was done in less than one minute. Several persons seriously and two fatally injured. An empty wagon, team and driver were carried about 100 yards. Near Fort Smith, Crawford, Co., Ark. 8th, about 3 p. m. a severe tornado accompanied with hail, (stones 2 or 3 inches in diameter,) passed to the northeastward. "The storm cloud looking like black smoke from a large furnace and its shape was like a funnel with its inside red as fire; the roaring was terrible and the cloud was filled with pieces of timber, branches of trees and fragments of clothing; everything was swept clean over the path of the storm which was very narrow; one person killed and several seriously injured." Detroit, Mich., 12th, 5 p. m. "a very destructive 'tornado' visited the northwestern part of the city, creating considerable havoc. The sky suddenly became overcast, a gale sprung up from the west and southwest which soon reached the velocity of a hurricane and swept houses, fences, gates &c. before it, the path was not over 500 feet wide." Rapids Parish, La., 14th, 'on Elmwood plantation, ten miles below Alexandria, twelve buildings were destroyed by a severe tornado. The track of the storm was about 250 yards wide and swept all objects before it; no lives were lost; the plantation bell weighing 300 pounds and numerous ploughs and parts of wagons were lifted up and transported long distances; entire loss estimated at \$10,000.' In Ouachita Parish, La., probably on the 14th, 'a tornado passed over Fisher's Landing, on Black river, destroying two or three houses and injuring several people;' Cairo, Ill., 14th, a "tornado, accompanied by hail and heavy rain struck the city at 1 p. m., demolishing several buildings and unroofing many others; one child was blown some distance and killed." Terre Haute, Ind., 14th, a. m., a violent wind and rain storm passed to the northeast, a

few miles south of the city, demolishing buildings and fences and uprooting trees. At Paoli and Princeton, Ind., 14th, a. m., a heavy "tornado" passed northeastward, unroofing houses and blowing down fences. Norwalk, Huron county, Ohio, 14th, about 11 a. m., a "terrible wind-storm or tornado" passed over the central portion of the county in a northeasterly direction, "tearing houses to pieces and scattering the contents in every direction; straw stacks, orchards, fences and barns were demolished, trees uprooted and animals killed." Louisville, Ky., 28th, 5:45 a. m., "a severe tornado swept over the southeastern portion of the city, marking its pathway by a broad track of demolished fences, uprooted trees and injured houses. The storm was a fearful one and passed directly from the southwest to the northeast. The cloud was an immense dark, whirling, tossing mass, which seemed to possess a wrenching, spiral motion, to which much of the damage was in all probability due. The wind was terrific, and carried every obstacle before it; coming at first in heavy gusts, it soon reached a steady hurricane-velocity." Greensburg, Ind., 28th, a. m., a heavy wind and rain-storm visited this place, blowing off roofs and tearing up trees. Madison, Ind., 28th, about 5 a. m., a heavy wind and rain-storm, accompanied with severe thunder and lightning passed over the city, causing considerable damage. Seymour, Ind., 28th, "about noon a dark and angry looking cloud rose in the west causing such intense darkness that it became necessary to light lamps. As it came up it rolled over and over making one revolution after another in quick succession. As it approached the town it rose and fell, sometimes coming below the tree-tops, shaving off every limb it came in contact with as if it had been done with an axe. When above the trees the sound of the wind resembled that of a mighty cataract. Its path was not over 200 yards wide and direction from southwest to northeast."

VERIFICATIONS.

Indications.—The detailed comparison of the tri-daily weather indications for November with the telegraphic reports for the succeeding twenty-four hours, shows the general per centage of omissions to be 0.03 per cent., and of verifications to be 90.8 per cent. The percentages for the four elements have been—weather, 94.0; direction of the wind, 88.9; temperature, 92.4; barometer, 87.8. The percentages of verification by geographical districts, have been: New England, 93.1; Middle States, 91.5; South Atlantic States, 90.6; Eastern Gulf States, 92.3; Western Gulf States, 88.7; Lower Lake region, 91.2; Upper Lake region, 92.4; Tennessee and the Ohio valley, 92.4; Upper Mississippi valley, 87.2; Lower Missouri valley, 87.6; Northern Pacific coast region, 95.0; Central Pacific coast region, 98.3; Southern Pacific coast region, 97.5. Of the 3,689 predictions that have been made, 95, or 2.58 per cent. are considered to have entirely failed; 92, or 2.49 per cent. were one-fourth verified; 268, or 7.26 per cent. were one-half verified; 159, or 4.31 per cent. were three-fourths verified; 3,075, or 83.36 per cent. were fully verified, so far as can be judged from the tri-daily weather maps.

Cautionary Signals.—236 Cautionary signals were displayed during the month, of which 219, or 92.8 per cent. were justified by winds of 25 miles per hour or over, at, or within a radius of 100 miles of the station. 82 Off-shore Signals were displayed, of which 80, or 97.6 per cent. were fully justified. Of the Cautionary Off-shore Signals 58 were changed from Cautionary. 260 of both kinds were displayed, of which 242, or 93.1 per cent. were fully justified. The above does not include 52 Signals ordered at display stations where the velocity is only estimated. Six signals were reported somewhat late; 67 cases were reported of winds of 25 miles or over where signals were not ordered.

NAVIGATION.

In the table on the right hand side of Chart No. III are given the highest and lowest readings of the Signal Service river gauges for the month, with the dates of the same. During the first half of the month the rivers in general continued quite low. From the 14th to the 25th higher readings were generally reported, but in no case did they approach near the danger-marks. The heavy rains previous to the 15th made a good navigable river in the Ohio at Pittsburgh for the first time since the early part of August. On the 18th low water on the Lower Fox river, Wis., compelled manufactures to run short time.

Ice in Rivers and Harbors.—The mild weather prevalent throughout October and the first half of November delayed the formation of ice to such an extent as not to interfere with navigation, except on the Upper Missouri and Red river of the North, until the last few days of the present month. The following notes on the formation of ice are of interest: The *Missouri* was closed by ice at Fort Buford, Dak., on the 27th; at Ft. Stevenson, Dak., floating ice passed down the river on the 2nd, 3rd and 21st, and the river was closed by ice from the 23rd to the 28th; at Bismarck, Dak., river froze over on the 2nd, but ice broke up on the 4th, and on the 27th the river was closed by ice; at Ft. Randall, Dak., floating ice passed down on the 22nd; at Yankton, Dak., floating ice was observed during the entire month; on the 20th the ferry-boat was frozen in; on the 29th the channel was frozen over for eight hours and navigation closed; at Plattsmouth, Neb., floating ice passed down on the 3rd and 4th, and on the 20th and 21st—on the 22nd it gorged at the railroad pile-bridge, and on the 24th and 25th the gorge lifted out the piles and destroyed bridge—26th, river was free of ice, but on the 29th and 30th floating ice was again reported. The *James River* at Morristown, Dak., was frozen over on the 1st—on the 7th the ice had all disappeared, but by the 27th the river was again frozen over. *Red River of the North.*—At Pembina, on the 1st, large quantities of floating ice passed down, and on the 2nd the river froze over and navigation closed, but on the 6th the ice was fast breaking up; at Winnipeg, Manitoba, on the 3rd, an ice bridge had formed over the river and persons crossed on foot. *Mississippi.*—At St. Paul, Minn., on the 2nd and the 24th the river was partly frozen, on the 20th full of floating ice, and owing to the masses of

anchor ice in the canal the leading flour mills were compelled to close their gates; at La Crosse, Wis., on the 20th and 21st much floating ice; at Dubuque, Iowa, 22nd, shore ice, 23rd, river full of floating ice, "navigation suspended;" floating ice was also reported at Davenport, 25th to 30th, at Muscatine, 24th and at Burlington on the 29th. *Rock River* at Rockford, Ill., was covered with thin ice on the 4th; on the 21st it froze over and remained partly frozen until the 25th, on the 27th the ice had disappeared. The *Manitowoc* river at Manitowoc, Wis., was closed by ice on the 20th, and the *Embarrass* river at Embarrass, Wis., was frozen over on the 30th. The *Toledo* river was covered by thin ice the 24th and 26th at Toledo, Ohio; at Sandusky, 20th, ice formed along the docks and on the 24th and 25th considerable floating ice was observed in the bay. The *Monongahela* at Morgantown frozen over on the 24th but opened on the 26th. On the 21st and 22nd, quite an ice blockade formed in the Erie canal at Rome and Auburn, N. Y., but the ice was broken up on the 23rd; on the 26th there was considerable floating ice in the canal at Whitehall, N. Y., and a tow of nine barges was frozen in on the 28th. *Lake Champlain*, West Charlotte, Vt., ice formed along the lake shores on the 21st and 30th. *Ottawa River*.—On the 24th navigation was practically closed by ice at Ottawa, Ontario, and the *St. John River* at Fredericton, N. B., was frozen over. *St. Lawrence River*.—On the 22nd was frozen over from above the rapids down to the Grand Trunk Railroad bridge; on the 26th ice was forming in considerable quantities along the shores of the Lower St. Lawrence, and two schooners were reported frozen in at Kamouraska; and, same date, steamer Bellona, the last boat of season from Montreal to Liverpool, got fast in ice at Lake St. Peter, near Three Rivers, but afterward got out and proceeded on the 29th.

High Tides.—Eastport, 15th, 16th.

Low Tides.—Baltimore, 21st, unusually low; Portsmouth, N. C., 9th, 10th, 11th, 12th, 26th 27th, unusually low.

TEMPERATURE OF WATER.

The Temperatures of Water, as observed in rivers and harbors, with average depth at which the observations were taken, are given on Chart No. II. At the following stations no observations were made on the dates indicated: At Cedar Keys, Fla., observations were commenced on the 16th; at Cleveland, the Lake was too rough on the 3rd, 18th, 20th, 23rd, 25th, 28th and 29th, and on the 21st and 22nd the pier was covered with ice and snow; at Escanaba floating ice prevented observations being made during the last three days of month.

ATMOSPHERIC ELECTRICITY.

Thunder-storms were reported in the various districts, as follows: New England, on the 3rd, 6th, 7th, 12th, 13th, 14th, 19th, 20th, 22nd; Middle Atlantic States, 3rd, 11th, 12th, 14th, 15th, 19th, 23rd, 29th; South Atlantic States, 15th, 19th; Eastern Gulf States, 6th, 11th, 13th, 14th, 15th, 17th, 27th, 28th; Western Gulf States, 5th, 8th, 9th, 11th, 13th, 14th, 17th, 27th; Ohio valley and Tennessee, 2nd, 9th, 10th, 12th, 13th, 14th, 15th, 16th, 17th, 27th, 28th, 29th; Upper Lake region, 8th, 9th, 10th, 11th, 12th, 14th, 15th, 26th, 27th, 28th; Lower Lake region, 2nd, 9th, 12th, 14th, 15th, 23rd; Upper Mississippi valley, 8th, 10th, 11th, 12th, 13th, 14th, 16th, 17th, 18th, 21st, 24th, 26th, 27th, 28th; Lower Missouri valley, 8th, 10th, 11th, 13th, 14th, 16th, 26th, 27th, 28th; Middle Eastern Rocky Mountain Slope, 8th, 10th, 11th, 13th, 14th, 16th, 17th, 26th, 27th.

Auroras.—Cambridge, Mass., regularly looked for 8 p. m.; none seen during the month; decidedly cloudy on the 2nd, 3rd, 6th, 8th, 9th, 11th, 12th, 13th, 14th, 15th, 17th, 18th, 19th, 20th, 27th, 28th; some clouds, with moonlight, 22nd, 25th; moonlight, 1st, 21st, 23rd, 24th, 26th, 29th, 30th; if present, might have been seen 4th, 5th, 7th, 10th, 16th. Calistoga, Cal., 26th, 8:30 p. m., extended from WNW. to NNE.; diffuse yellow light; no streamers. Olivet, Dak., 6th, slight diffuse light. Augusta, Ill., 30th. Fort Wayne, Ind., 13th, 14th. Iowa City, Ia., 5th, 14th, 30th. Fall River, Mass., 1st. Vineland, N. J., 12th. Starkey, N. Y., 3rd, 13th, 21st. Ringgold, Ohio, 3rd, 10th. Milton, Pa., 15th, 5:30 p. m., two arches, colors dark, tinged with red; disappeared at 6 p. m. Bismarck, 11th, from 6 to 10 p. m., white nebulous light. Toledo, 1st, 10 p. m., single arch. Port Huron, 28th.

OPTICAL PHENOMENA.

Solar Halos were reported from the various districts on the following dates:—New England, on the 2nd, 10th, 11th, 21st, 22nd and 27th; Middle States, 2nd, 10th, 19th, 26th and 30th; South Atlantic States, 5th, 6th, 11th, 12th, 22nd, 28th and 29th; Lake Region and Ohio valley, 2nd, 7th, 8th, 10th, 15th, 16th, 21st, 22nd, 24th, 26th, 27th, 29th and 30th; Gulf States, 4th, and from the 23rd to the 27th; Northwest, 4th, 5th, 7th, 9th, 11th, 13th, 16th, 17th, 19th, 20th, 21st, 23rd, 25th, 26th, 27th and 30th; New Mexico, on the 3rd; Nevada, 6th and 25th; California, on the 1st and 2nd.

Lunar Halos were reported from the various districts on the following dates:—New England from the 22nd to the 29th, inclusive; Middle States, 1st and 2nd, and from the 20th to the 30th; South Atlantic States, 2nd, 3rd and 5th, and from the 21st to the 30th; Florida, 24th 25th and 29th; Alabama, 24th; Mississippi 5th and 24th; Southwest, 19th to 30th; Tennessee, 22nd to 26th and on the 30th; Ohio valley, 1st to 3rd, 22nd to 27th and on the 30th; Lower Lake region, 1st, 24th and 30th; Upper Lake region, 1st to 3rd, 21st, 24th, 25th and 29th; Northwest, 2nd to 5th, and from the 20th to the 30th; Colorado, 25th, 28th, 29th and 30th; New Mexico, 2nd, 28th and 29th; Nevada, 24th, 25th and 29th; Idaho, 4th, 19th and 23rd; California, 1st, 2nd, 27th, 29th and 30th.

MISCELLANEOUS PHENOMENA.

Prairie and Forest Fires.—Creswell, Kans., 3rd, 5th, 7th, 12th, 14th, 15th, 18th, 19th, 20th, 21st, 22nd, 23rd and 25th; Mt. Solon, Va., 6th, 7th, and 17th on mountains; Pike's Peak, 5th and 6th; Fort Sill, 7th, 8th, 10th, 24th, 26th and 30th; Fort Gibson, 2nd, 3rd, 4th, 5th, 6th, 7th 19th, 21st, 23rd, and 25th; Dodge City, 19th; Henrietta, Tex., 7th; Pembina, 4th, 7th, 8th, 10th; Boerne, Tex., 23rd.

Meteors.—Mr. Chas. G. Boener, of Vevay, Ind., in a special report upon the November meteors, states that observations were made from the 10th to 16th, inclusive: "The nights of the 10th, 11th and 12th, were more or less cloudy and foggy, but that of the 13th presented a clear, bright sky, attended by a mild and dry atmosphere, without any obstacle to interpose the most favorable opportunity for observations. The display did not, in anywise, approximate, either in numbers or brilliancy, those of former years. The total number counted, in six hours, on the night of the 13th, was 44; seven of the 1st magnitude, fifteen of the 2nd, eighteen of the 3rd, and four of the 4th. During the night of the 14th, threatening and rainy weather prevailed, and the nights of the 15th and 16th were not marked by any special phenomena. Many of our people who have been misled by the predictions and speculations of Prof. Tice, of St. Louis, after having sacrificed several nights, watching in vain, for the expected shower, feel chagrined over their disappointment, and are now very emphatic in expressing grave doubts about the wisdom and ability of their great favorite weather oracle." Trenton, N. J., 24th, 3:45 a. m., "very brilliant meteor passed from north to south, looking nearly as large as a barrel and accompanied by a hissing noise; as it neared the earth it exploded like a rocket;" Southington, Conn., 16th; Anna, Ill., 13th and 22nd; Lyndon, Ill., 15th; New Corydon, Ind., 1st, 3rd, 4th, 12th, 13th, 14th, 25th and 26th; St. Meinrad, Ind., 7th and 13th; Ft. Dodge, Ia., 24th; Yates Center, Kan., 3rd; Woodstock, Md., 3rd, 4th, 7th, 12th, 13th, 14th, 15th, 16th, 20th, 29th and 30th; Emmitsburg, Md., 21st; Sandy Springs, Md., 30th; New Bedford, Mass., 10th, 16th and 30th; Rowe, Mass., 7th and 22nd; Ypsilanti, Mich., 1st and 9th; Brookhaven, Miss., 8th; Fayette, Miss., 2nd, 15th and 16th; Oregon, Mo., 12th, 15th and 29th; Independence, Mo., 8th; Plattsmouth, Neb., 2nd, 13th, 14th and 15th; Genoa, Neb., 11th; Vineland, N. J., 16th; Linden, N. J., 17th; Waterburg, N. J., 7th and 9th; Ithaca, N. Y., 13th and 14th; Hector, N. Y., 11th; North Lewisburg, Ohio, 13th; McMinnville, Tenn., 6th; Pike's Peak, Col., 20th; Indianola, Tex., 5th, (13th, counted 48 from 2 to 4 a. m.); Pensacola, Fla., 12th and 13th; Springfield, Ill., 20th; Davenport, Ia., 13th; St. Louis, Mo., 12th, several; Louisville, Ky., 14th and 29th; Savannah, Ga., 12th, 13th, 20th and 24th; Smithville, N. C.; 14th; Boise City, Idaho, 14th and 21st; Punta Rassa, Fla., 13th. The Bucyrus (Ohio) *Journal*, November 15th, states: "during the early morning, a farmer of White's township was struck by an aerolite, which passed entirely through his body, causing instant death. The meteor appeared to come from the south-southwest and fell obliquely at an angle of about 60°." Syracuse, N. Y., 28th, about 5 a. m., a "heavy explosion was heard and a bright light was seen in the northwestern sky, which was supposed to have resulted from the passage of a meteor." On the north fork of the Canadian river, Indian Territory, 13th, between 1 and 3 a. m., meteors were seen to fall like hail. In Missouri, "very few meteors were seen on the 13th and 14th, although the sky was favorable at many stations; on the 18th, fifteen faint meteors were observed at Corning, Mo., between 7:30 and 10:30 p. m., which appeared to radiate from near Aquilla."

Earthquakes.—"At Arequipa, Peru, on the morning of October 2nd, 1879, a strong shock was felt, lasting 30 seconds; it is described as being the strongest felt since the great earthquake of 1868; the walls of many churches and buildings were cracked." *The North China Herald* publishes a translation of a memorial written by the Governor-General of Kansu, regarding the disastrous earthquakes in that province and Shense. The shocks extended from June 29th to July 11th, 1879, and reports of loss of life and destruction of property have been received from nearly thirty cities and districts. On July 1st a violent shock occurred causing the ground to open; city walls, public and other buildings were leveled and a large number of people, (varying from ten in some places to 200 or 300 in others) were crushed to death. In some places only one shock was felt, in others several in succession, while in others the shocks continued for ten days." November, 1879, Costa Rica, C. A., 18th, 10:40 a. m., slight shock. Beirut, Syria, 15th, 8:35 p. m., slight shock. Boise City, Idaho, 25th, 2:04 p. m., slight shock, lasting about two seconds, vibration from east to west; this shock was also felt at Idaho City, 35 miles north of station; 26th, a second shock was felt in the latter city, but very faint. Burlington, Vt., 3rd, 7:15 a. m., slight shock lasting several seconds; some people reported the occurrence of a second shock several minutes later. Contoocookville, N. H., 4th, 7:10 a. m., slight shock causing windows to rattle.

Sunsets.—The characteristics of the sky at sunset, as indication of fair or foul weather, for the succeeding twenty-four hours, have been observed at all Signal Service stations. Reports from 132 stations show 3,939 observations to have been made, of which 37 were reported doubtful; of the remainder 3,245 or 82.5 per cent were followed by the expected weather.

Grasshoppers.—Ft. Sill, 21st, disappearing, very few to be seen; Erath co., Tex., 8th, "the grasshoppers have destroyed what little wheat there was up"; Bosque co., Tex., 8th, "large fields of wheat have been destroyed, and the grasshoppers are still remaining"; Denton co., Tex., 8th, "grasshoppers have moved southwards"; Hood co., Tex., 8th, 65 acres of wheat were destroyed on one farm.

Polar Bands.—New Corydon, Ind., 16th, 21st, 24th; Guttenburg, Ia., 3rd; Yates Center, 9th; Gardiner, Me., 10th, 22nd; Freehold, N. J., 2nd, 23rd; Ringgold, Ohio, 1st; Wytheville, Va., 1st, 3rd, 5th, 21st, 22nd, 26th, 27th, 30th; Pembina, 27th; Detroit, 24th.

Mirage.—Pembina, Dak., 3rd, 25th.

Rain-bow.—Burlington, Vt., 6th, during a light fall of snow the flakes were particularly noticeable for their perfect symmetry and while the sun was still above the horizon a beautiful rain-bow was formed in two segments, one in the ESE. and the other in the ENE.

Zodiacal Light.—Cambridge, Mass., regularly looked for at 8 p. m., suspected on the 4th and somewhat visible on the 7th, 10th, 16th; observations on other evenings hindered by moonlight or clouds. New Corydon, Ind., 21st, 22nd, 23rd, 24th, 25th; Monticello, Iowa, 15th; Oregon, Mo., 15th; Waterbury, N. Y., 17th; Brookhaven, N. Y., 26th.

Sun Spots.—The following record of Solar phenomena by Mr. D. P. Todd, Assistant in the Nautical Almanac Office, is communicated by him for publication in this REVIEW:—

DATE— Nov., 1879.	No. of new—		Disappeared by solar rotation.		Reappeared by solar rotation.		Total number visible.		REMARKS.
	Groups	Spots.	Groups	Spots.	Groups	Spots.	Groups	Spots.	
4th, 8 a. m.	1	1	0	0	0	0	1	1	
4th, 4 p. m.	0	0	0	0	0	0	1	1	
5th, 3 p. m.	0	0	0	0	0	0	0	0	Faculae.
7th, 8 a. m.	4	25	0	0	0	0	4	25	{ Faculae.
7th, 3 p. m.	0	0	0	0	0	0	4	25	
9th, 1 p. m.	0	0	0	10	0	0	2	11	
10th, 8 a. m.	0	0	0	0	0	0	2	11	
11th, 4 p. m.	0	4	1	1	0	0	1	14	
13th, 8 a. m.	0	4	0	0	0	0	1	18	
14th, 4 p. m.	0	0	0	0	0	0	1	4	Spots of considerable size.
16th, 8 a. m.	0	0	0	0	0	0	1	3	{ Broad areas of Faculae.
16th, 10 a. m.	0	0	0	0	0	0	1	3	
17th, 8 a. m.	0	0	0	0	0	0	1	3	
21st, 8 a. m.	0	0	1	3	0	0	0	0	Spots probably disappeared by solar rotation.
26th, 8 a. m.	0	0	0	0	0	0	0	0	Faculae.
27th, 9 a. m.	1	3	0	0	0	0	1	3	Faculae.
29th, 8 a. m.	1	3	0	0	0	0	2	4	Faculae.
30th, 11 a. m.	0	0	0	0	0	0	1	3	

NOTE:—On the 1st, at 5 p. m.; 2nd, 5 p. m.; 22nd, 8 p. m.; 23rd, 9 a. m.; 24th, 8 a. m.; 25th, 4 p. m. the sun was also observed by Mr. Todd, but was entirely free from spots or faculae.

Prof. Hinrichs, Iowa City, Ia., reports, "sunspots large, indicating that the very protracted period with few or no spots is now definitely closed".

Mr. William Dawson, at Spiceland, Ind., observed no spots on the 2nd and 3rd, sky very poor. 4th, one small spot midway between the centre and eastern edge of the sun. 6th, a group of four spots, one large with penumbra close to the southeast margin. 12th, a large group of about 25 spots (definition poor) in the southwest quadrant; ones pot—or rather two very close together—appeared to be five or six thousand miles across; it had a large penumbra. 13th, one group of 25th spots. 16th, one group of three spots close to western edge. 18th, one spot and a considerable number of faculae at the eastern and western edges. 19th, 21st, 24th, no spots. 28th, two spots close to each other near the eastern edge, faculae. 30th, nine spots, one group, about half-way from the centre to southern edge of the sun bearing eastward; one spot quite large with penumbra.

Mr. David Trowbridge, at Waterburg, N. Y., observed the sun on the following dates, but saw no spots, 3rd, 4th, 5th, 20th, 23rd, 25th, 27th, 30th. On the 7th, at 8:30 a. m., one spot near eastern margin of the sun's disk; 8th, 25 spots; 9th, 25 spots, in a large and small group; 10th, 7:30 a. m., three spots visible in one group, and a fourth one very faint; 13th, one large spot; 16th, one spot still visible, but quite faint, and situated near the western margin. The last group has undergone many changes during its visibility.

Mr. F. Hess, of Fort Dodge, Iowa, observed spots as follows: 6th; 1 p. m., one large oblong spot with a partial penumbra, and one small one without penumbra near the southeastern limb of the sun; 7th, 8 a. m. one large round spot surrounded by a penumbra and four smaller ones with white faculae, all very distinct and lying in the southeastern quadrant; 1 p. m. one large and one small spot surrounded by a common penumbra, four others and faculae all in the southeast quadrant; 9th, 10 a. m. one large and ten smaller spots in the southeast quadrant; 14th and 15th, 1 p. m., one large and ten smaller spots in the southwest quadrant; 16th, 3 p. m. only two spots but close together and surrounded by a common penumbra in the southwest quadrant; 28th, 8 a. m. one large faint spot near the sun's lower limb; 29th, 7 a. m., one large spot with penumbra and one small spot in the southeast quadrant; 9 a. m., one large spot with penumbra and two small ones, and faculae in the southeast quadrant; 10th, 10 a. m., three spots were visible, but the weather was too hazy and windy for distinct vision. The sun was examined all other days of the month but no spots were seen.

Observations were made at Fort Whipple, Va., each day during the month but no spots observed.

NOTES AND EXTRACTS.

Meteorological Observations on the Swedish Northeast Passage Expedition.—The *Vega*, in command of Professor Nordenskiöld, was frozen in on September 28th, 1878, in 67° 7' N. and 173° 30' W. From letters dated up to April 1st, 1879, and later, the following abstract is made, (see *Nature*, November 13th, 1879.) The thickness of ice between the *Vega* and shore was as follows: 1878, September 28th, too thin to bear a man; October 3rd, thick enough for the Tchukches natives; December 1st, 56 centimetres or 22.04 inches. 1879,

January 1st, 92 centimetres or 36.22 inches; February 1st, 108 centimetres or 42.52 inches; February 15th, 120 centimetres or 47.24 inches; March 1st, 123 centimetres or 48.42 inches; April 1st, 127 centimetres or 50.00 inches; May 1st, 154 centimetres or 60.63 inches; June 1st, 154 centimetres or 60.63 inches; July 1st, 103 centimetres or 40.55 inches. Open water always existed a short distance to the northward.

The Temperature during the winter was as follows :

MONTH.	MINIMUM.		MAXIMUM.		MEAN.	
	Centigrade.	Fahrenheit.	Centigrade.	Fahrenheit.	Centigrade.	Fahrenheit.
1878, October.....	- 20°.8	- 5°.44	+ 0°.8	33°.44	- 5°.21	22°.62
November.....	- 27.2	- 16.96	- 6.3	20.66	- 16.59	2.14
December.....	- 37.1	- 34.78	+ 1.2	34.16	- 22.81	- 9.06
1879, January.....	- 45.5	- 49.90	- 4.1	24.62	- 25.05	- 13.09
February.....	- 43.8	- 46.84	+ 0.2	32.36	- 25.08	- 13.15
March.....	- 39.8	- 39.64	- 4.2	24.44	- 21.65	- 6.97
April.....	- 38.0	- 30.40	- 4.6	23.72	- 18.93	- 2.07
May.....	- 26.8	- 16.24	+ 1.8	35.24	- 6.97	19.45
June.....	- 14.3	- 6.26	+ 6.8	44.24	- 9.60	30.02

The Barometric Pressure was high, 1878, December 22nd, 6 a. m., 782.0 millimetres, or 30.79 inches, and 1879, February 17th, 6 a. m., 788.1 mm. or 31.03 in.; it was lowest 1873, December 31st, 2 a. m., 723.3 mm. or 28.48 in.

The Surface Winds were almost constantly between NW. and NNW., but the lower clouds moved with similar regularity from SE., which latter current, when it sank to the ground, brought heat and comparatively dry air. The natives say that mountain heights exist in the Tchuktche Peninsula, and this may explain the *föhn*-like properties of the SE. wind. The coldest winds come from the SW. and W., or from the Siberian plain.

Snow-fall was not particularly great, but it drifted remarkably during high winds. Snow was precipitated from the stratum of air within a few inches of the ground on clear nights, and was drifted from NW. to SE. over the north coast of Siberia to more southerly regions.

Auroras were at a minimum of frequency and brilliancy, but the faint auroral arches were studied with great success. These remained unaltered in position hour after hour, and day after day they were constantly visible in clear weather. The average height of these arches Nordenskiöld determined to be about .03 of the earth's radius, or about 120 miles, and a very interesting theory is broached by him in this connection.

Tidal observations gave a maximum range of 18 centimetres or 7 inches, while the wind affected the water by nearly 2 metres, or 6 feet.

Aeronautics.—In *Nature*, November 20, 1879, p. 64, Dr. B. W. Richardson describes the successful method of Mr. Fleuss for living under water, and concludes as follows: "In whatever way Mr. Fleuss gets breathing-room under the water, he has, without a doubt, achieved a great practical success. He has learned how to live independently for a long time shut off from all external access of air. He has learned, if I may so say, to become artificially amphibious, and if his plan succeeds, the cumbrous diving-pumps are done away with and the art of diving is vastly simplified.

"Again, if he can live so long on the small reserve which he carries down with him in his dress, he has only to enlarge the dress, to expand it, that is to say, into a submerged vessel, to be able to go anywhere under the sea and do with intelligence what is now left to unintelligent mechanism. What such an intelligent direction might do with torpedoes it is not at all pleasant to contemplate.

"The plan may be used for the purposes of deep-sea exploration, and the suggestion I made respecting my Salutlanders, that they sought for discoveries on the floors of the great oceans, may be so much nearer to accomplishment than the time which I assign to it, that I may happily live to have the return laugh at what was called 'the most visionary of speculative fancies.' It is equally probable that the aéronaut may be able to rise much higher than he has yet done in this dress or in a car specially constructed on a similar plan.

"The apparatus may almost certainly be applied at once to another service very different in kind and on land instead of water. When a man can move about with an air-supply in his pockets, so to speak, he can go into fire as well as water. In a fire-proof non-conducting dress, provided with a Fleuss' breathing apparatus, a fireman could enter a burning house, and without danger of suffocation go wherever the weight of his body could be borne.

"Lastly, in wells charged with foul air, or in mines charged with choke-damp and other poisonous gases, the Fleuss apparatus will, I feel certain, prove of the greatest practical service, and I am happy in being the means of introducing it at length to the notice of my *confrères* in science."

A balloon liberated October 7th, at Waukesha, Wis., fell near Milwaukee, Wis., on October 10th. It had been driven eastward and then westward to its landing place.—[*Nature*, Nov. 20th.

Atmospheric Electricity.—The following extract from *Nature*, November 20, p. 72, is based on an article in the *Journal de Physique*, for October: "For observation of atmospheric electricity M. Mascart uses a Thomson electrometer connected with a vessel having continuous outflow of water. The deflections of the

needle are transmitted every two and a half minutes to a pencil which records them on a sheet of paper. The series of traces forms a curve, not continuous, indeed, but nearly so. This apparatus was put in action at the College of France in the end of February this year, and the curves obtained during the following five months present several interesting features. The potential of the air is shown to be generally positive, with more or less rapid variations. In bad weather the curves become more irregular; rain nearly always produces very great negative deflections. The change of sign appears before the rain comes, and sometimes rain is followed by very high positive indications. There are also some very rare cases of positive rains, and of great negative deflections without apparent rain in the neighborhood. (This predominance of negative electricity in rain clouds M. Mascart regards as an important point in the question of the origin of atmospheric electricity.) Neglecting accidental variations, one is struck by the fact that the electricity is much more uniform at night and more variable by day. The potential is also considerably higher at night than in the day. The maximum seems to occur about 9 or 10 p. m.; the curve descends slowly towards 6 a. m., then more rapidly; reaches a minimum about 3 p. m., and then rises again in a nearly uniform manner. The indications by the curves are confirmed by numerical tables of monthly averages of eight daily observations at three hours interval. The results thus obtained are in contradiction with ideas commonly adopted. M. Mascart remarks that the continuous maximum of positive electricity observed at night may be of an exceptional character, owing to the anomalous season; he also suggests the possibility of previous observations having been vitiated through defective insulation."

Clouds and Cyclones.—Prof. J. K. Laughton, in Fraser's *Magazine*, August, 1879, gives the following summary of the views of Rev. W. C. Ley:—"This simple theory is to some extent in accordance with fact; but to the recent and still continuing investigations of the Rev. W. Clement Ley we owe not only a more comprehensive description of cyclonic weather, but a singularly ingenious interpretation of it."

"It has long been the custom amongst meteorologists to conceive the cyclone as divided into two halves by the line of its advance, named right and left in the same way as the banks of a river, looking, that is, in the direction in which it is travelling. Mr. Ley now proposes another division, that namely, by the diameter drawn at right angles to the line of its advance; and these halves he would call the front and the rear. According to this division, a cyclone is quartered into right and left front, right and left rear; and Mr. Ley believes that he has established the fact that the different types of weather belong not so much to the different winds as to the different quarters of the cyclone. He describes the front as being preceded by a fringe of cirrus and very high cirro-stratus, extending in streaks to a distance of perhaps 100 miles; these, as they advance, curl upwards and outwards, as though kept asunder by electrical repulsion; but as they come over the observer, they are then 'seen to be more or less reticulated, forming a filmy sheet, the structure of which becomes less and less discernible.' In other cases the threads are but faintly marked from the first, and 'the sky seems simply to become gradually overspread with a milky-looking film of whitish cloud matter.' Bit by bit as it advances, this sheet seems to grow downwards, until it is shut out from our view by the interposition of dark masses of lower cloud; the barometer, till then slightly on the rise, begins to fall; the sky becomes covered with nimbus, and rain is more or less general, the right front being the quarter of heaviest precipitation. As the center, or the transverse diameter approaches, the nimbus breaks; on the right side, the blue sky begins to peep through, and with broken showers and shower clouds, cumulus, cirro-stratus, cirrus, and a rising barometer, the cyclone passes away; whilst on the left, the sky is frequently overcast and hazy to the last."

"In explanation of these appearances Mr. Ley considers that, in general terms, the air throughout the front of the cyclone has a slight upward movement, the expansion due to which is of itself enough to account for the heavy rain-fall frequent in that half; the excess in the right front depending perhaps on its geographical position. He considers that a large portion of the air which has so ascended in front, having been whirled round and having its moisture squeezed out of it, is forced downward in the rear, appearing as a northerly wind, cold and dry by reason not of its coming from the north, but of its coming from above. It is from this condensation of vapour and the comparative vacuum so formed in front, this pressure of a descending current in the rear, that Mr. Ley would attribute the onward march of a cyclone, which he conceives as continually dying out, and being continually re-formed in advance."

PUBLISHED BY ORDER OF THE SECRETARY OF WAR.

Albert J. Myer

Brig. Gen. (Bvt. Assg^d.) Chief Signal Officer, U. S. A.

Copy furnished for



WEATHER MAP.
 BY THE U.S. ARMY.
 FOR THE BENEFIT OF COMMERCE AND AGRICULTURE.

No. 1.



AS OF LOW BAROMETER FOR NOVEMBER, 1879.

BY ORDER OF THE SECRETARY OF WAR.

Albert J. Meyer

ASSG'D, CHIEF SIGNAL OFFICER, U. S. A.

NOTE.—The Roman letters show number and order of areas of low barometer. The figures above the lines show the days of the month; those below, 1, 2 and 3, indicate respectively the 7:30 A. M., the 4:30 P. M., and 11 P. M., (Washington mean time,) observations. The small circles on the lines indicate the position of the center of the area of low barometer; the day and report, written respectively above and below the line.

6851.101

WAR DEPARTMENT
SIGNAL SERVICE, U. S.
DIVISION OF TELEGRAMS AND REPORTS FOR THE BENEFIT

25° 25°

San Francisco 30.75
San Diego 34.00
Albany 30.00
Buffalo 30.00
Burlington, Vt. 30.00
Charleston 30.00
Chicago 30.00
Cleveland 30.00
Detroit 30.00
El Paso 30.00
Galveston 30.00
Grand Haven 30.00
Jacksonville 30.00
Key West 30.00
Marquette 30.00
Milwaukee 30.00
Mobile 30.00
New London 30.00
New York 30.00
Norfolk 30.00
Portland, Maine 30.00
Punta Raza 30.00
San Francisco 30.00
San Juan 30.00
San Francisco 30.00
San Juan 30.00
San Francisco 30.00
San Juan 30.00

TEMPERATURE OF WATER FOR NOVEMBER, 1907.

STATIONS.	Temperatures at bottom, f.		Average depth of water, in feet.
	Max.	Min.	
Albany.....	44°	28°	12
Angora.....	59	49	1
Baltimore.....	59	48	1
Buffalo.....	50	36	1
Burlington, Vt.....	50	42	1
* Cedar Key.....	50	36	11.5
Charleston.....	54	36	6
Chicago.....	49	34	5
* Cleveland.....	54	35	5
Detroit.....	51	34	23
Duluth.....	41.5	34	10.5
Eastport.....	47	43	19.5
* Eureka.....	44.5	36.5	12.5
Galveston.....	77	37	12.5
Grand Haven.....	54	33	19
Jacksonville.....	74	59	19
Key West.....	80	66	18
Marquette.....	43.5	34	18.5
Milwaukee.....	49	34	15
Mobile.....	70	57	12.5
New London.....	56	41	18
New York.....	54	43	15
Norfolk.....	56	45	22
Portland, Maine.....	45	40	25
Punta Raza.....	70	64	13
San Francisco.....	54	31	0.5
San Francisco.....	50	37.5	20
San Juan.....	60	49	11.5
San Francisco.....	50	37	0
San Juan.....	60	50	11.5
San Francisco.....	50	43	0

Observations for only part of month—see text.

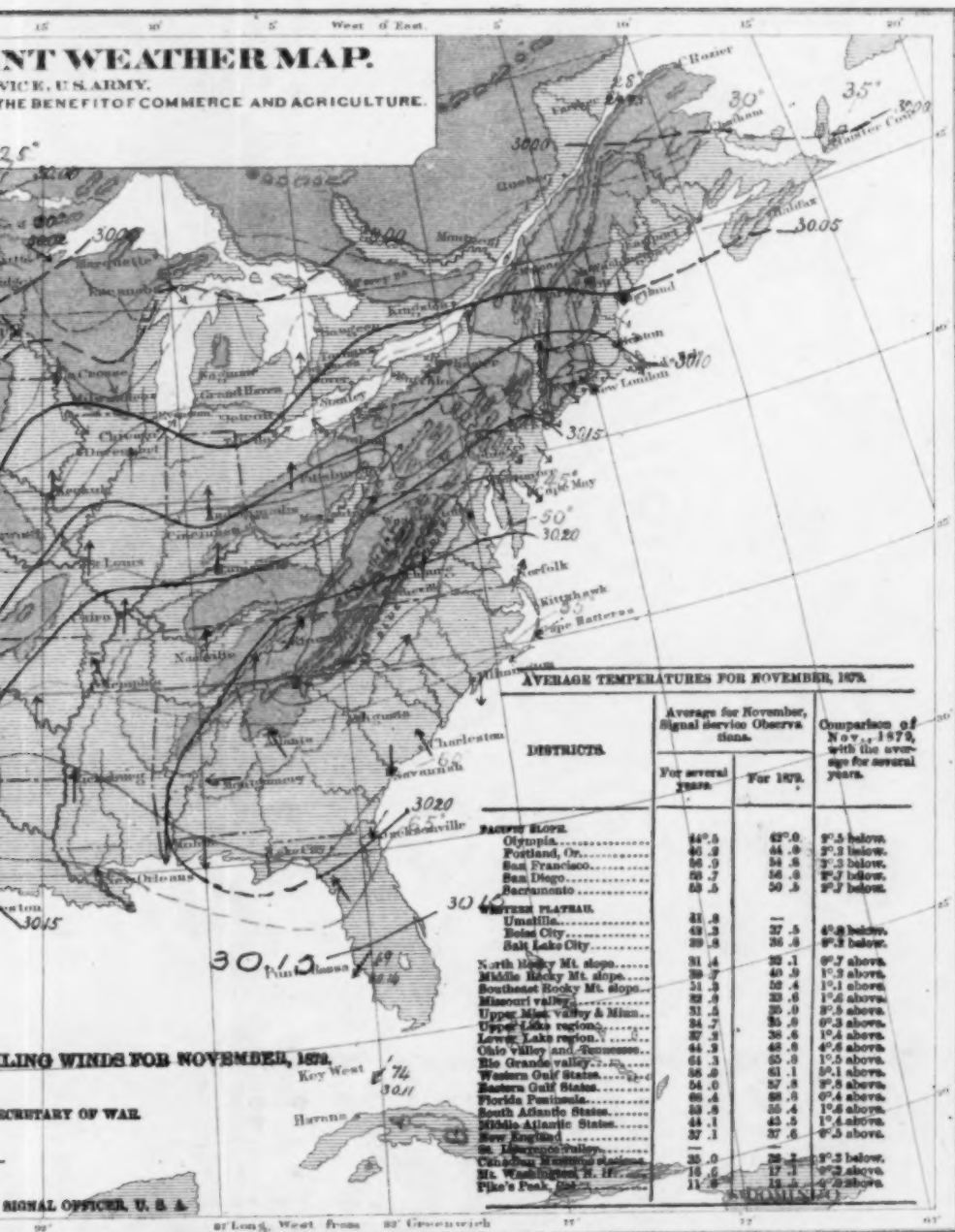
107° 102° 97° 92°

STATIONS.	Temperatures at bottom.		Average depth of water, in feet.
	Max.	Min.	
Albany.....	44°	36°	12
Augusta.....	69	49	10
Baltimore.....	59	48	10
Buffalo.....	59	46	10
Burlington, Vt.....	59	46	11
Cedar Key.....	64	54	11
Charleston.....	64	56	10
Chicago.....	54	34	5
* Cleveland.....	54	34	5
Deerick.....	51	34	23
Duluth.....	41.5	34	10
Eastport.....	47	43	19.5
* Eureka.....	54.5	24.5	15
Gulfport.....	77	52	19
Hartford.....	67	50	10
Jacksonville.....	74	50	10
Key West.....	80	66	10
Marquette.....	43.5	34	18.5
Milwaukee.....	53	34	15
Mobile.....	70	27	23.5
New London.....	56	41	19
New York.....	56	43	15
Norfolk.....	56	40	23
Portland, Maine.....	46	40	23
San Francisco.....	78	64	13
Savannah.....	54	31	0.5
San Francisco.....	59	37.5	30
Seaside.....	45	40	11.5
Tripoli.....	60	50	11.5
Woods Hole.....	58	43	6

* Observations for only part of month—See text.

NT WEATHER MAP.

VIC K. U. S. ARMY.
THE BENEFIT OF COMMERCE AND AGRICULTURE.



AVERAGE TEMPERATURES FOR NOVEMBER, 1872.

DISTRICTS.	Average for November, Signal Service Observations.		Comparison of Nov., 1872, with the average for several years.
	For several years.	For 1872.	
PACIFIC SLOPE.			
Olympia.....	44.5	43.0	1.5 below.
Portland, Or.....	40.8	44.0	3.2 below.
San Francisco.....	56.9	54.8	2.1 below.
San Diego.....	58.7	56.8	1.9 below.
Sacramento.....	55.5	50.5	5.0 below.
EASTERN PLATIAU.			
Omaha.....	31.8	37.5	5.7 below.
Boise City.....	29.3	36.8	7.5 below.
Salt Lake City.....	29.8	36.8	7.0 below.
North Rocky Mt. slope.....	31.4	32.1	0.7 above.
Middle Rocky Mt. slope.....	30.7	40.9	10.2 above.
Southeast Rocky Mt. slope.....	31.3	32.4	1.1 above.
Missouri valley.....	32.9	33.6	0.7 above.
Upper Miss. valley & Minn.....	31.5	30.0	1.5 above.
Upper Lake region.....	34.7	35.0	0.3 above.
Lower Lake region.....	37.3	36.6	0.7 above.
Ohio valley and Tennessee.....	44.3	45.8	1.5 above.
Rio Grande valley.....	41.3	45.8	4.5 above.
Western Gulf States.....	36.0	41.1	5.1 above.
Eastern Gulf States.....	34.0	37.8	3.8 above.
Florida Peninsula.....	36.4	38.6	2.2 above.
South Atlantic States.....	33.8	35.4	1.6 above.
Mobile Atlantic States.....	44.1	43.5	0.6 above.
Sea Islands.....	37.1	37.6	0.5 above.
LAKE SUPERIOR VALLEY.			
Canadian stations.....	35.0	38.2	3.2 below.
Mt. Washington N. H.....	18.0	17.1	0.9 above.
Fiske's Peak, N. H.....	11.8	18.5	6.7 above.

CLING WINDS FOR NOVEMBER, 1872.

SECRETARY OF WAR.

SIGNAL OFFICER, U. S. A.

C. S. L. L.

WAR DEPARTMENT SIGNAL SERVICE, U.S.A.
DIVISION OF TELEGRAMS AND REPORTS FOR THE BENEFIT OF THE ARMY.
PRECIPITATION CHART FOR NOVEMBER.

AVERAGE PRECIPITATION FOR NOVEMBER

DISTRICTS	Average for November.		Comparison of November, 1879, with the Average for many years.	
	For many years.	For 1879.	Inches.	Inches.
St. Lawrence Valley.....	3.05	3.05	2.00 excess.	
New England.....	4.15	3.95	2.90 deficiency.	
Middle Atlantic States.....	3.15	1.80	2.15 deficiency.	
South Atlantic States.....	2.90	2.30	2.54 deficiency.	
Florida Peninsula.....	3.25	1.00	2.27 deficiency.	
Eastern Gulf Division.....	3.10	2.00	2.00 deficiency.	
Western Gulf Division.....	4.10	3.95	1.15 deficiency.	
Tennessee.....	3.80	4.99	1.13 excess.	
Ohio Valley.....	3.75	2.94	0.19 excess.	
Lower Lake Region.....	3.30	3.32	0.37 excess.	
Upper Lake Region.....	2.30	4.80	2.50 excess.	
Upper Mississippi Valley.....	1.75	4.40	3.65 excess.	
Minnesota.....	1.10	0.92	0.18 deficiency.	
Lower Missouri Valley.....	2.14	3.47	3.33 excess.	
Upper Missouri Valley.....	0.47	0.20	0.27 deficiency.	
California Coast.....	1.90	3.79	1.89 excess.	
Portland, Or.....	7.50	4.08	3.30 deficiency.	

PUBLISHED BY ORDER OF THE SECRETARY
Albert J. Meyer
SIGNAL GEN. (M.T. ASS'D.) CHIEF SIGNAL OFFICE

DISTRICTS	Average for November.		Comparison of November, 1879, with the Average for many years.
	For many years.	For 1879.	
	Inches.	Inches.	Inches.
Nt. Lawrence Valley.....	3.05	3.02	2.50 excess.
New England.....	4.15	2.96	0.90 deficiency.
Middle Atlantic States.....	3.53	1.80	2.12 deficiency.
South Atlantic States.....	2.93	1.80	0.54 deficiency.
Florida Peninsula.....	3.25	1.93	1.27 deficiency.
Eastern Gulf States.....	4.16	2.86	1.66 deficiency.
Western Gulf States.....	4.10	3.05	1.15 deficiency.
Tennessee.....	3.80	4.09	1.12 excess.
Ohio Valley.....	3.75	3.94	0.19 excess.
Lower Lake Region.....	2.58	2.58	0.37 excess.
Upper Lake Region.....	2.20	4.00	2.50 excess.
Upper Mississippi Valley.....	1.75	4.40	3.65 excess.
Minnesota.....	1.10	4.09	0.18 deficiency.
Lower Missouri Valley.....	1.18	3.47	3.23 excess.
Upper Missouri Valley.....	0.47	3.80	0.27 deficiency.
California Coast.....	1.90	3.79	1.40 excess.
Portland, Or.....	7.50	4.16	3.26 deficiency.

No. III.

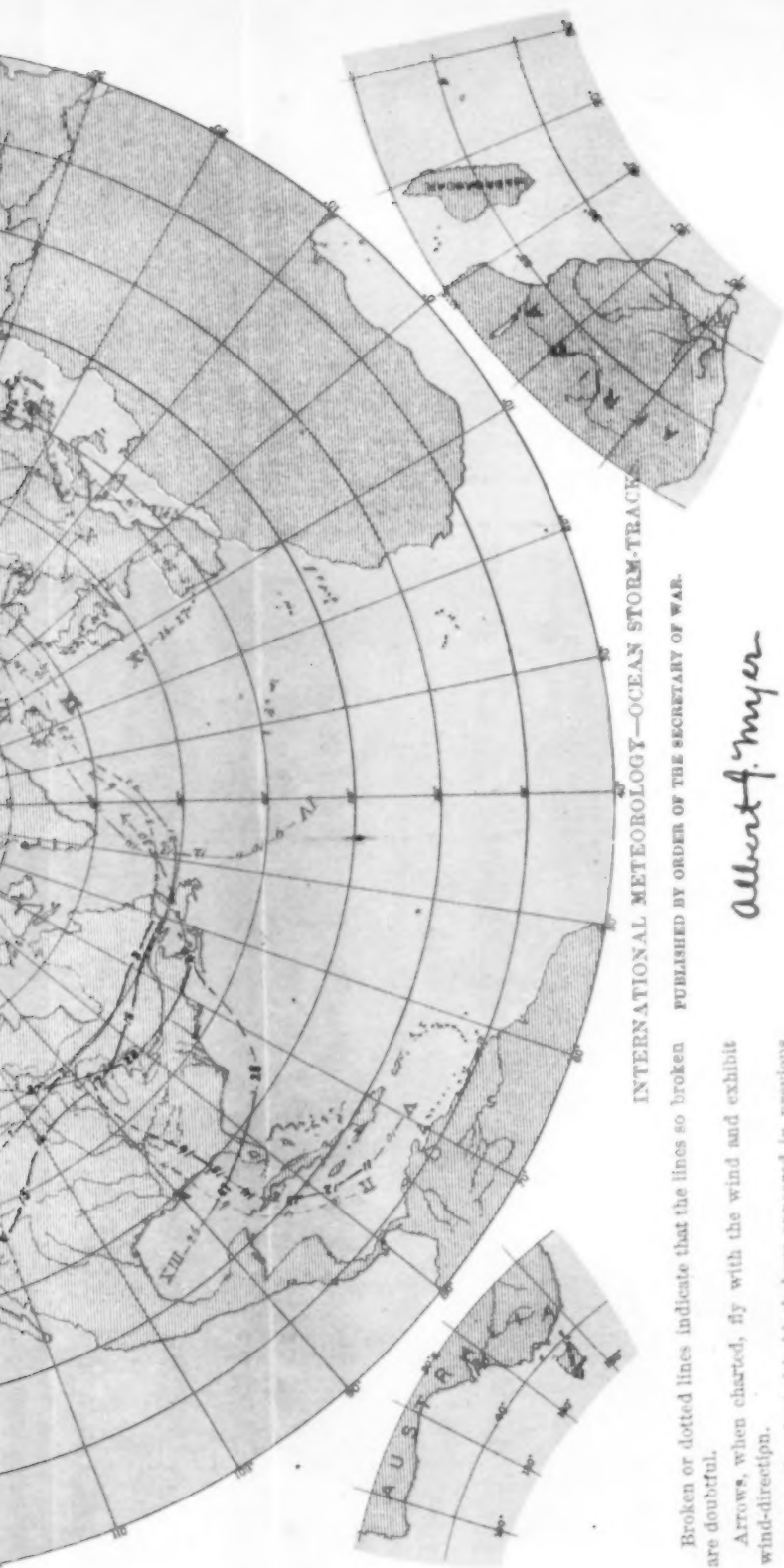


INDEX TO STORM-TRACKS

[illegible]

X. from Oct. 1966 to April, 1970.





Broken or dotted lines indicate that the lines so broken are doubtful.

Arrows, when charted, fly with the wind and exhibit wind-direction.

the tracks charted in black have appeared in previous
Reviews.

The tracks charted in red have been made from data collected since preceding *Revises*.

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PUBLISHED BY ORDER OF THE SECRETARY OF WAR.

Albert F. Myer

BRIG. GEN., (BVT. ASSG'D.) CHIEF SIGNAL OFFICER, U. S. A.

THE HALLMARK PRINTING CO. 227 DEARBORN ST. CHICAGO

INTERNATIONAL MONTHLY CHART.
 Showing mean pressure, mean temperature, mean force and prevailing direction of winds at
 7.35 A. M., Washington mean time, for the month of April, 1878, based
 on the daily charts of the International Bulletin.





PREVAILING WINDS.

Arrows show the direction of, and fly with, the wind.
Force is also shown as follows:

SYMBOLS.	FORCE.	VELOCITY.	
		Miles per hour.	Metres per second.
↑	1, 2	0 to 9	0 to 4.0
↑↑	3, 4	9.1 to 23.5	4.1 to 10.1
↑↑↑	5, 6	23.6 to 40.5	10.1 to 18.1
↑↑↑↑	7, 8	40.6 to 67.5	18.1 to 30.2
↑↑↑↑↑	9, 10	67.6 up	30.2 & over.

PUBLISHED BY ORDER OF THE SECRETARY OF WAR.

Albert H. Meyer

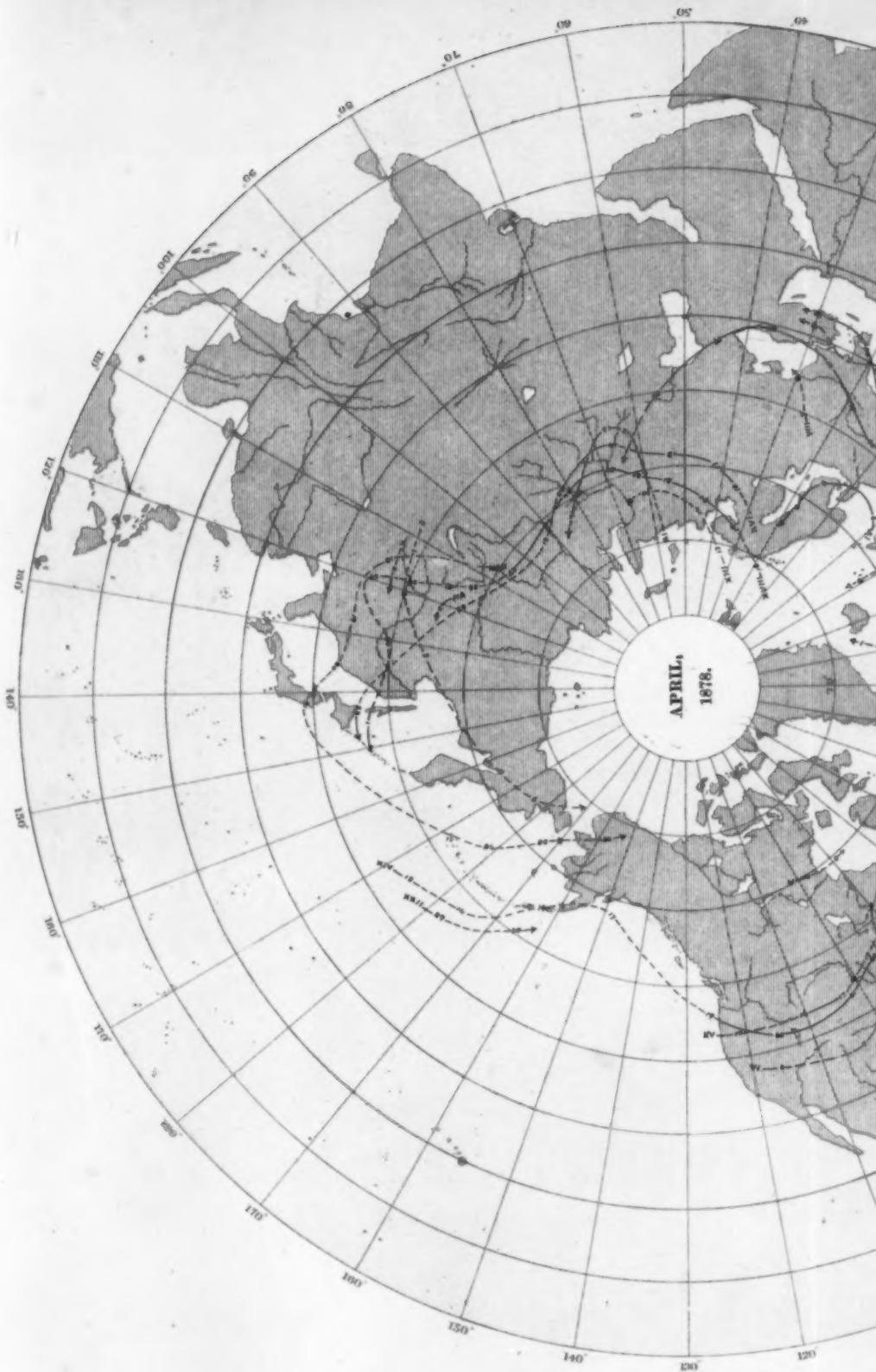
BRIG. GEN. (RVT. ARMO'D) CHIEF SIGNAL OFFICER, U. S. A.

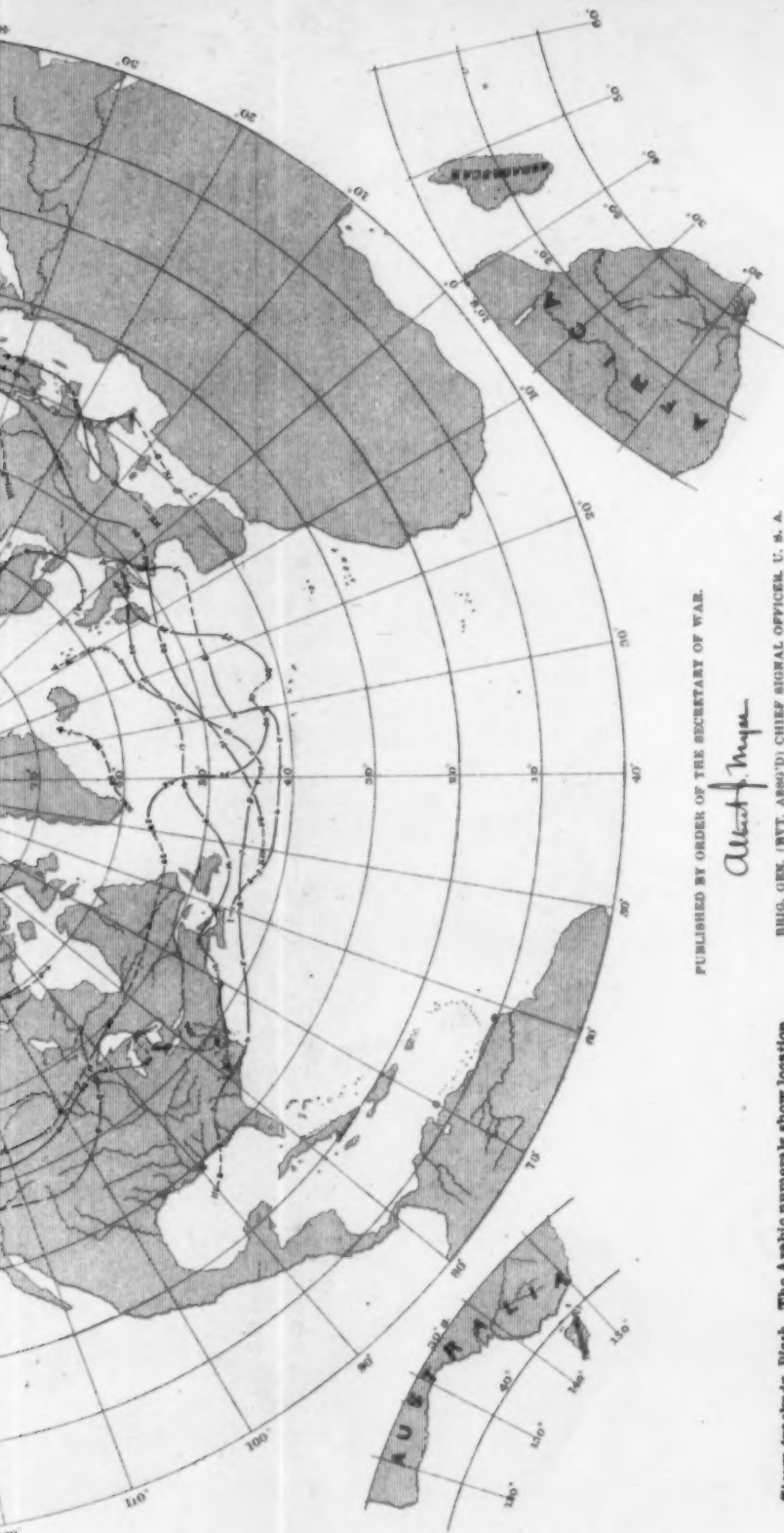
ISOBARS AND ISOTHERMS.

Isobars in blue; detached barometer means in English inches.

Isotherms in red; detached temperature means in degrees Fahrenheit.

INTERNATIONAL CHART.
Showing Tracks of Centres of Low Barometer for
April, 1878.





PUBLISHED BY ORDER OF THE SECRETARY OF WAR.

Auth. Map

BRIG. GEN. (RET. ARMY) CHIEF SIGNAL OFFICER U. S. A.

Storm-tracks in Black. The Arabic numerals show location of the centres of Low Barometer, at 7:36 A. M., Washington mean time, of that date.
Broken or dotted lines, are doubtful.